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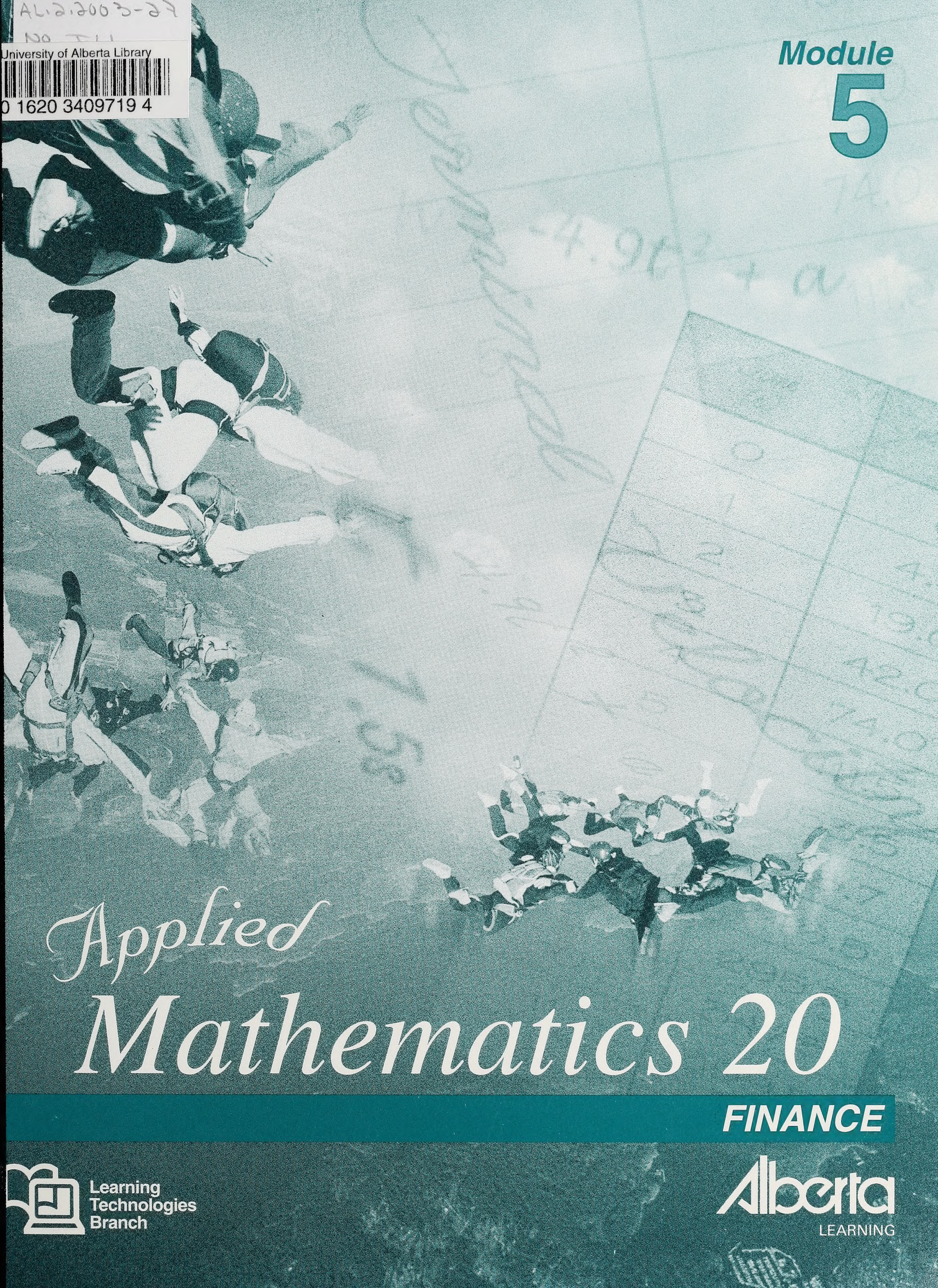

Module
5

Applied Mathematics 20

FINANCE

Learning
Technologies
Branch

Alberta
LEARNING

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Module

5

Applied Mathematics 20

FINANCE

Learning Technologies Branch

Alberta LEARNING

Applied Mathematics 20
Module 5: Finance
Student Module Booklet
Learning Technologies Branch
ISBN 0-7741-2015-0

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Teachers	✓
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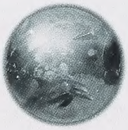
General Public	
Other	



You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

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Welcome

Applied Mathematics 20

Module 1
Graphs

Module 2
Non-Linear Functions

Module 3
Linear Systems

Module 4
Linear Programming

Module 5
Finance

Module 6
Circles

Module 7
Measurement

Welcome to Module 5. We hope you'll enjoy your study of Finance.

Applied Mathematics 20 contains seven modules and a final test. Work through the modules in the order given, since several concepts build on each other as you progress through the course.

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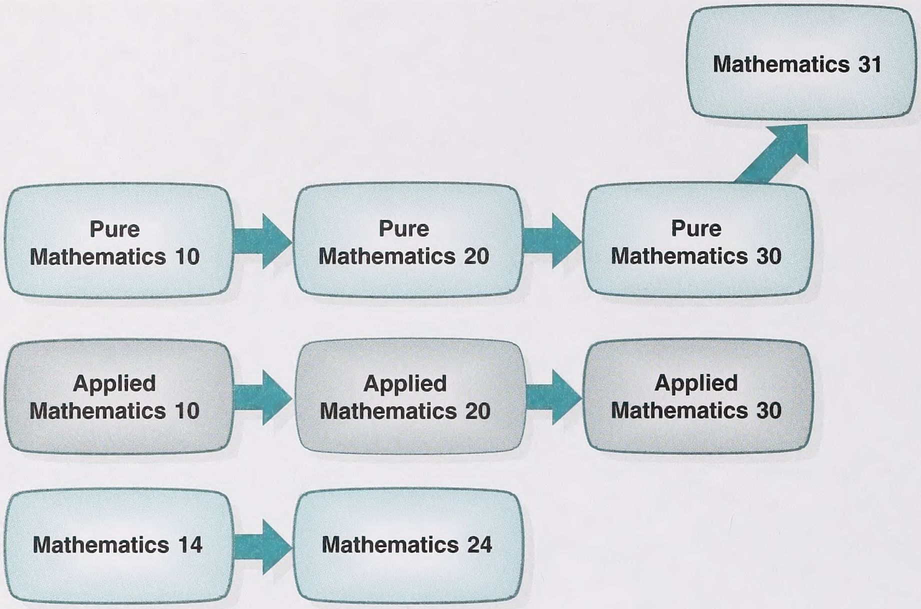
Introduction to Applied Mathematics 20

Applied Mathematics 20 is the second course in the Applied Mathematics 10–20–30 program of studies. Another program of studies is Pure Mathematics 10–20–30; students who complete Pure Mathematics 30 often choose to take Mathematics 31. A third program of studies is Mathematics 14–24.



Each mathematics program is designed for students with different mathematical strengths and interests.

- Pure Mathematics 10–20–30 is intended for students who are strong in algebra and mathematical theory.
- Applied Mathematics 10–20–30 is better suited to students who prefer to solve problems using numerical reasoning or geometry.
- Mathematics 14–24 is a general mathematics program for high school students who have experienced difficulties in previous mathematics courses.

Each sequence of courses is designed for students with different career plans. For example, Pure Mathematics 30 is a prerequisite for admission to many university programs. Many colleges and technical institutes, however, will admit students who have successfully completed Applied Mathematics 30.

You may find it helpful to read “Questions and Answers About Senior High School Mathematics” and “The New Senior High School Mathematics Program and Post-Secondary Studies.” These documents can be found at the following Internet site:

http://www.learning.gov.ab.ca/k_12/curriculum/bySubject/math

Before enrolling in Applied Mathematics 20, it is recommended that you talk with a school counsellor about your career plans.

TRANSFERRING FROM THE APPLIED PROGRAM

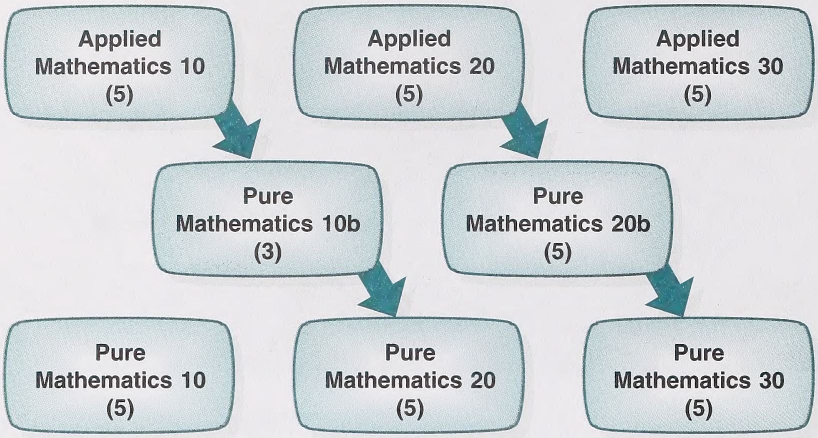
You should be aware that the applied and pure mathematics courses do have some topics in common; other topics are independent.

The following table shows some common and independent topics.

Applied Topics	Common Topics	Pure Topics
• linear programming • data tables and trends • design and layout • metric and imperial measure • data presentation • vectors and matrices • periodic, fractal, and recursive patterns • financial decision making • costing and design problems	• spreadsheets • line segments and linear graphs • scaling • triangles • surveys • financial mathematics • quadratic functions • circle geometry • the bell curve	• irrational numbers • exponents • polynomial and rational expressions • mathematical expectation • growth patterns • linear and non-linear systems • operations on functions • mathematical reasoning • exponential and logarithmic functions • conics • combinations • trigonometric functions

If you want to transfer from the Applied Mathematics 10–20–30 sequence to the Pure Mathematics 10–20–30 sequence at a future time, you won't have to repeat the topics that are common to pure mathematics and applied mathematics.

If you decide to transfer to Pure Mathematics 20 after successfully completing Applied Mathematics 10, you may have to take a three-credit course called Pure Mathematics 10b. If you decide to transfer to Pure Mathematics 30 after successfully completing Applied Mathematics 20, you may have to take a five-credit course called Pure Mathematics 20b. The two bridging courses are shown in the following diagram.

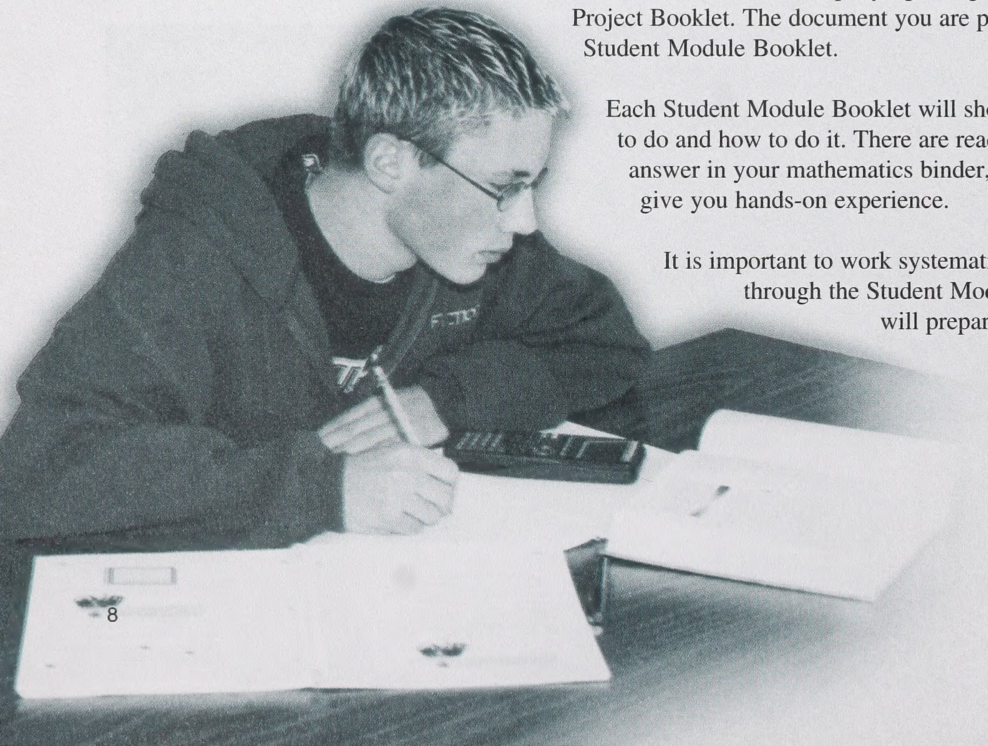


STRATEGIES FOR COMPLETING APPLIED MATHEMATICS 20

For each module in Applied Mathematics 20, there is a Student Module Booklet, an accompanying Assignment Booklet, and a Project Booklet. The document you are presently reading is called a Student Module Booklet.

Each Student Module Booklet will show you, step by step, what to do and how to do it. There are readings, questions for you to answer in your mathematics binder, and applications that will give you hands-on experience.

It is important to work systematically and carefully through the Student Module Booklets. This work will prepare you for the assignments, projects, and final test.



Following are some suggestions for organizing your mathematics binder:

- Keep a section of your binder to record your responses to the questions in the Student Module Booklet. Also store your marked assignments here.

- Keep a section of your binder for work in progress on your projects. Keep your research notes, plans, rough drafts, and so on.

- Keep a section of your binder to record new skills and concepts, as well as important results and formulas. Get in the habit of describing new skills and concepts in your own words.

  Record useful ways to help you remember what a concept means. Make charts and diagrams to help you connect mathematical ideas.

- Keep a section of your binder to record mathematical accomplishments. This can include solutions to problems that you are proud of solving. It can also include landmark events, such as when you grasped a difficult concept (an "aha!" experience), or when you used a calculator or spreadsheet in a new way.

Mathematical Processes

Throughout this course, you will be expected to perform the following mathematical processes:

- Connect mathematical ideas to everyday experiences and to concepts in other disciplines.
- Develop and use problem-solving strategies.
- Reason and justify your answers.
- Communicate mathematical ideas.
- Select and use appropriate technologies to solve problems.
- Develop and use estimation and mental-math strategies.
- Use visualization to assist in processing information, making connections, and solving problems.

In order to develop these mathematical processes more fully, you are encouraged to ask someone who is also taking Applied Mathematics 20 to be your study partner. You will find that having a friend to discuss mathematical ideas with will make your studying more enjoyable.

Resources You Will Need

In addition to the distance learning materials for Applied Mathematics 20, you will need the following resources:

- the *Addison-Wesley Applied Mathematics 11 Source Book*, Western Canadian Edition, published by Addison Wesley Longman Ltd. (2000)
- a binder, lined loose-leaf paper, graph paper, dividers, pencils, eraser
- metric and imperial measuring devices, such as a ruler, yardstick, metre-stick, and tape measure
- a mathematical instrument set (compass, protractor, and triangles)
- a computer with a spreadsheet program

  Note: Two popular spreadsheet programs are *ClarisWorks*™ and Microsoft® *Excel*.

- a graphing calculator

  Note: Where it is applicable, the examples in this course and the textbook show the TI-83 calculator; however, all of the graphing calculators in the following chart are approved for use on tests.

Texas Instruments	Sharp	Casio	Hewlett-Packard
TI-82** TI-83 TI-83 Plus TI-86 TI-89 TI-92* TI-92 Plus	EL-9600C EL-9600* EL-9200* EL-9300*	Algebra FX 2.0 CFX-9850 GA-Plus* CFX-9850 G* CFX-9800 G* FX-9700 series*	HP 39g

*no longer commercially available

**The TI-82 calculator will remain on the approved list for the 2000–2001 and 2001–2002 school years and will then be deleted from the approved list.

If you intend to use the TI-83 or TI-83 Plus graphing calculator, it is recommended that you obtain the video program *The TI-83 Graphing Calculator Video Tutor*.

Many of the resources that you will need may be purchased locally or from the Learning Resources Centre (LRC). Following is the LRC website:

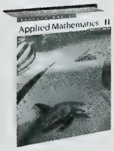
http://www.lrc.learning.gov.ab.ca

You may wish to discuss the availability of resources with your teacher, as your school division may have a loan policy.

Visual Cues

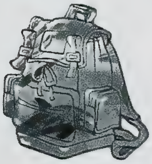
You will find many visual cues in this course. Colour is used to highlight terms that are defined in the Glossary of the Appendix of each Student Module Booklet. You will also find several icons in the margins. Read the following explanations to discover what the various icons prompt you to do.

- Refer to the textbook.



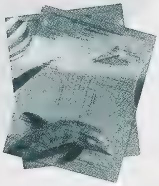
- Refer to the Applied Mathematics 20 CD.

- Use mathematical instruments or measuring tools.

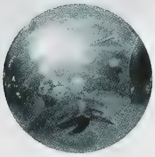


- Work with a computer.

- Complete the module project or assignment.

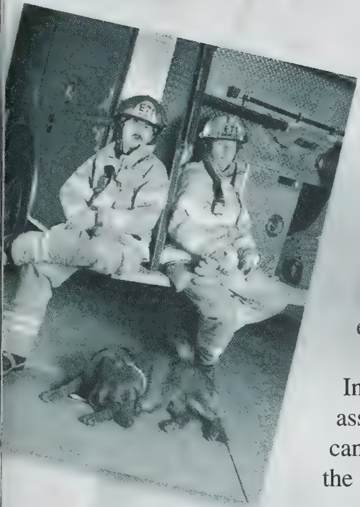


- Explore the Internet.



Remember: Any Internet website address given in this module is subject to change.

MODULE OVERVIEW



Just about everybody hopes to have a good job or operate a business and earn a good living so that he or she can feel secure about the future. Earning a living gives people the means to rent an apartment or buy a house, own a vehicle, save for the future, and perhaps travel to far-away, interesting places.

A study of finance will give you a greater understanding of what to expect in the job market and what is involved when living on your own. Managing your finances usually requires preparing a budget to help juggle your income and expenses.

In this module you will investigate earning a living and the financial considerations associated with living on your own. In particular, you will explore different ways you can be paid for the work you do, payroll deductions, taxes, housing costs, banking, the cost of credit, saving for the future, and preparing a budget.

ASSESSMENT

Accompanying this Student Module Booklet is a Project Booklet and an Assignment Booklet. Your grading in this module will be based upon the module project and the module assignment you submit for evaluation. The mark distribution is as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

Remember that Activities 1 to 8 in this Student Module Booklet will prepare you for completing the module project and the module assignment. You should work through these activities carefully and compare your answers with the suggested answers provided in the Appendix.

The Follow-up Activities provide extra help and enrichment. You may choose to do some or all of the questions in the Follow-up Activities. Again, you should compare your answers with the suggested answers provided in the Appendix.

MODULE PROJECT

BUDGETING FOR LIVING INDEPENDENTLY

Beginning the Project

Many young people, with a mix of excitement and trepidation, look forward to the day they will be living independently. It is exciting to think of the day you will be on your own, in your own apartment or house, attending college or working full time, and earning enough income to meet your daily needs. Perhaps you will earn enough to buy a vehicle and save for the future.

Will your income be sufficient to meet all your expenses? How much will your rent and utilities be? What about food, clothing, entertainment, and transportation? If you do get your own car, will you lease it or purchase it over time? How will you pay for registration, insurance, fuel, and maintenance? What if it breaks down? Will you have enough cash on hand for emergency repairs? How can you plan for all contingencies?

Your module project for Module 5: Finance is Budgeting for Living Independently. This project involves researching what your income will be, what the costs of leasing or purchasing a vehicle are, what your daily expenses will be, and how to incorporate a strategy for saving for the future. The challenge is to balance your income and expenses.

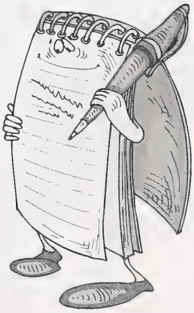
An important part of your budget will hinge on your decision to lease or buy a car. To help you sort through some of the costs associated with each option, you may wish to talk to a local car dealer or visit the following websites:

- **http://www.leaseguide.com**
- **http://ln.infoplease.com/ipa/A0193143.html**

Turn to page 220 of the textbook and read "Living Independently." Answer the questions posed near the bottom of the page, and store your responses in the project section of your mathematics binder.

After you have recorded some of your initial ideas for your project, begin researching the costs associated with leasing or buying a car of your choice. Also, begin researching some of the other costs associated with living independently. To start, visit the Internet site given on page 221 of the textbook. This website has links to several sites you may find helpful. **Note:** The topics are listed under the heading "Independent Living," not "Living Independently."

As you work through Activities 1 to 8, continue to research budgeting items. Talk to family members and friends who are living independently. You will be given more direction on how to complete this project later in this module. In the meantime, feel free to discuss your project with your study partner or a family member. Remember, the work you submit must be your own.



ACTIVITY 1

Earning a Living

How do you plan to make your living? The Inuk woman in the photo sews caribou clothing at home and sells them through a local co-operative. Her earnings are based on the number of garments she completes. Earnings based on the number of items produced is an example of **piecework**.

Will you earn your living through piecework, or will you have a job, such as teaching, that pays a **salary** (the same amount each month)? Another possibility is working in a job that pays an hourly or daily **wage** with possibilities for overtime pay, as, for example, a store clerk. You could also work in sales, where part of your income is a **commission** based on your sales during each **pay period**.

To explore how people in various jobs are paid, view the segment titled *Sales Income* on the Applied Mathematics 20 CD.

The governments of Canada, the territories, and the provinces all have regulations that govern the workplace. These regulations deal with such issues as minimum wage, hours of work, and pay periods. Federal legislation covers a variety of workers, such as truckers involved in interprovincial transport, bank and radio-station employees, and First Nations employees.

If you have access to the Internet, you can review these regulations at the following website:

http://info.load-otea.hrdc-drhc.gc.ca/labour_standards/home.htm

For the Western provinces and the territories, visit the following websites:

- Alberta: **http://www3.gov.ab.ca/hre**
- B.C.: **http://www.labour.gov.bc.ca/esb**
- Manitoba: **http://www.gov.mb.ca/working.html#hrc**
- Saskatchewan: **http://www.labour.gov.sk.ca/standards/index.htm**
- Northwest Territories: **http://www.gov.nt.ca**
- Nunavut: **http://www.gov.nu.ca/hr.htm**
- Yukon: **http://www.gov.yk.ca/services/l.html#LabourServices**

In this activity, you will explore a variety of methods of calculating how much you will be paid by your employer. Several of these calculations involve using percent. To review how percent is used, study the following example.

Example

Jenna purchased a CD costing $20 before taxes. The GST is 7%.

a. Write 7% in decimal form.

b. What is the GST on Jenna's purchase?

c. If Jenna paid a total of $22.60 for the CD, and this amount included both GST and PST, what percent is the PST?

Solution

a.

$$\begin{aligned} 7\% &= \frac{7}{100} \\ &= 0.07 \end{aligned}$$

b. The GST is 7% of the price of the CD.

$$\begin{aligned} 7\% \text{ of } 20 &= 0.07 \times 20 \\ &= 1.40 \end{aligned}$$

The GST is $1.40.

c. Jenna paid a total of $\$22.60 - \$20.00 = \$2.60$ in taxes.

$$\begin{aligned} \therefore\ \text{GST} + \text{PST} &= \$2.60 \\ \$1.40 + \text{PST} &= \$2.60 \\ \text{PST} &= \$2.60 - \$1.40 \\ &= \$1.20 \end{aligned}$$

Determine what percent of $20 is $1.20.

You must determine x, where

$$\frac{1.20}{20.00} = \frac{x}{100}$$

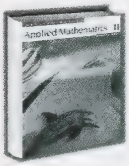
$$\frac{1.20}{20.00} \times 100 = \frac{x}{100} \times 100$$

← Multiply both sides by 100 to isolate x.

$$\frac{1.20}{20.00} \times 100 = x$$

$$\begin{aligned} x &= \frac{1.20}{20.00} \times 100 \\ &= 6 \end{aligned}$$

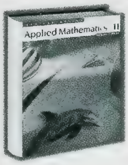
Therefore, the PST is 6% of the purchase price.



1. Turn to page 222 of the textbook and answer exercises 1 to 3 of "Practise Your Prior Skills."

Compare your responses with the suggested answers in the Appendix, Activity 1, page 65.

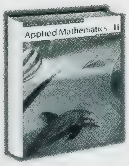
Besides working with percentages, another useful skill in this activity is the ability to interpret a wage graph.



2. Turn to page 222 of the textbook and answer exercises 1 to 5 of “Investigation 1: Interpreting a Wage Graph.”

Compare your responses with the suggested answers in the Appendix, Activity 1, pages 65–66.

In the next part of this activity you will review some of the terms associated with methods employers use to determine **gross pay**—the total received each pay period before deductions (Canada Pension Plan, Employment Insurance, income tax, and so on). You will also work through examples involving overtime and commission sales.



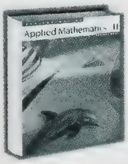
Turn to page 223 of the textbook and read from the top of the page to Example 1; then work through “Example 1: Determine Gross Earnings Including Overtime,” “Example 2: Calculate Graduated Commission,” and “Example 3: Compare Earnings Plans” on pages 223 to 225 of the textbook.

3. Answer the following exercises on pages 225 to 227 of the textbook.

   a. exercises 1 to 4 of “Discussing the Ideas”
   b. exercises 1 to 6, 8, and 10 of “Exercises: Checking Your Skills”

Compare your responses with the suggested answers in the Appendix, Activity 1, pages 66–70.

LOOKING BACK



In this activity you examined several ways employers calculate their employees’ gross pay. These included salaries, wages, overtime, and commission.

4. Turn to page 227 of the textbook and answer “Communicating the Ideas.”

Compare your response with the suggested answer in the Appendix, Activity 1, page 71.

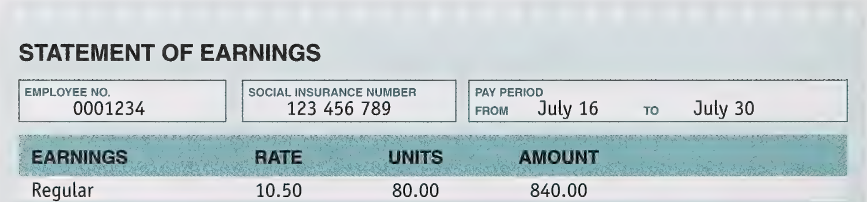
ACTIVITY 2

Payroll Deductions

The employment advertisements in a newspaper often give the hourly, weekly, or monthly pay prospective employees can expect to receive. The quoted figure in these advertisements is the gross income. It is not the take-home pay!

In this activity you will analyse the various deductions taken off the gross income, and you will calculate the **net income** for various types of employment situations.

Neil is a chef at one of the local restaurants. A sample of his statement of earnings is given.



STATEMENT OF EARNINGS

EMPLOYEE NO. 0001234	SOCIAL INSURANCE NUMBER 123 456 789	PAY PERIOD FROM July 16 TO July 30

EARNINGS	RATE	UNITS	AMOUNT
Regular	10.50	80.00	840.00
Overtime	15.75	3.00	47.25

DEDUCTIONS	CURRENT	YEAR TO DATE	OTHER DECUCTIONS	
CPP	35.26	513.68	Group Insurance	10.01
EI	19.96	310.17	United Fund	2.25
Income Tax	187.60	2,882.66	Professional Dues	13.31
			RRSP	44.36
			Payroll Savings Plan	37.50

GROSS INCOME	TOTAL DEDUCTIONS	NET INCOME
887.25	350.25	537.00

This statement shows Neil's gross pay for two weeks, the **basic deductions** set by the federal government, his personal deductions, the total of all deductions, and his net pay.

1. Use Neil's statement of earnings to answer the following.

  a. List the basic deductions and calculate the total of these deductions.

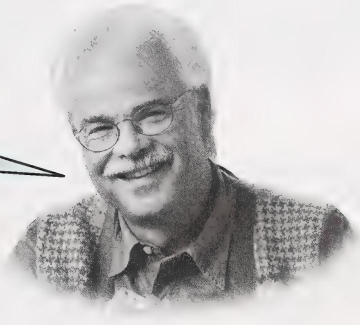
  b. What percent of Neil's gross income are the basic deductions? Round your answer to 1 decimal place.

2. What other personal deductions may appear on a statement of earnings?

3. Explain, in words, how net pay is determined. Write a word formula to determine net pay.

Compare your response with the suggested answer in the Appendix, Activity 2, page 71.

In the next part of this activity you will examine basic deductions in more detail. Remember, basic deductions are Canada Pension Plan (CPP) contributions, Employment Insurance (EI) premiums, and income tax.



Turn to pages 228 and 229 of the textbook and read the introductory paragraphs of Tutorial 5.2, "Payroll Deductions."

Your employer uses printed tables or computer software to determine CPP contributions and EI premiums. Examples of CPP and EI deduction tables for the 1999 taxation year are given on pages 286 to 288 of the textbook. These deductions are based on gross income and will be the same regardless of where you live in Canada. The higher your gross income, the higher your contributions and premiums will be. However, there are yearly maximums. In 1999, the maximum yearly CPP contribution was $1186.50 and the maximum yearly EI premium was $994.50.

Your employer also uses tables or software to determine the amount of income tax that will be withheld from you and remitted to the federal government on your behalf. The income tax deducted from your paycheque depends on two factors: your **taxable income** and your **tax credits**, as determined from the TD1 (Tax Deduction 1) form you completed for your employer when you started the job. Your taxable income is the difference between gross income and total tax-exempt deductions, which may include Registered Pension Plan (the employer's retirement plan) deductions, Registered Retirement Savings Plan (RRSP) contributions, and union or professional dues.

Taxable Income = Gross Income − (RRP deductions + RRSP contributions
+ Union or Professional dues)

The TD1 form is used to calculate tax credits, which are used to reduce the amount of income tax you have to pay. These tax credits are based on a basic personal amount and other amounts, such as spousal amounts and tuition amounts for post-secondary education. The total on a TD1 form will vary from employee to employee. For the income tax table that appears on page 289 of the textbook, the total amount on the TD1 form will determine the claim code the employer should use. The claim codes range from 0 to 10. As the amount in personal tax credits increases, the claim code the employer uses increases.

If you have access to the Internet, you can download a copy of the TD1 form from the Canada Customs and Revenue Agency website:

http://www.ccra-adrc.gc.ca

To see how the tables are used to determine the basic deductions, turn to pages 229 and 230 of the textbook and work through "Example 1: Calculate Net Earning."

4. Answer the following exercises on pages 233 and 234 of the textbook.

   a. exercises 1 and 2 of "Discussing the Ideas"

   b. exercises 1 to 8 of "Exercises: Checking your Skills"
   Note: Louis Robitaille's pay stub is found on page 228 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 2, pages 72–74.

If you do not have access to any tax tables, you can estimate EI, CPP, and income tax deductions. These estimates are outlined at the top of page 231 of the textbook. Remember, the figures you obtain are estimates only. In particular, income tax rates vary among provinces and territories.

Turn to pages 231 and 232 of the textbook and work through "Example 2: Estimate Net Earnings." **Note:** The method of estimating taxable income involves estimating the total income tax paid (both federal and provincial). As a result, the federal graduated method of calculation is not used. The estimate is determined by using a single percentage of the taxable income between the given ranges. As stated in the textbook on page 231, this estimate may be high if the taxable income is near the low end of the range and low if the taxable income is near the high end of the range.

5. Answer exercises 10 and 11 of "Exercises: Checking Your Skills" on page 234 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 2, pages 74–75.

LOOKING BACK

In this activity you calculated taxable income and net income and examined various payroll deductions, including Canada Pension Plan (CPP), Employment Insurance (EI), and income tax.

6. Make a list of some of the services funded by provincial and federal tax dollars.

Compare your response with the suggested answer in the Appendix, Activity 2, page 76.

ACTIVITY 3

Expenses

Susan accompanied her parents on a trip to San Francisco. Just before they left, Susan went to the bank and converted $500 of her savings to American dollars. When she got back to Canada, Susan still had $75 in American currency. She returned to her bank and converted this amount to Canadian dollars and deposited it into her account. How much did Susan spend on her trip?

The answer is not simply $\$500 - \$75 = \$425$! Five hundred dollars Canadian is not the same as $500 American. To determine what $500 Canadian is in American dollars, you need to know the **exchange rate**. You can find exchange rates for major world currencies published in the financial section of a major newspaper, like *The Edmonton Journal* and *The Calgary Herald*.

Knowledge about exchange rates is just one more thing you need to keep your financial house in order. Another is **unit pricing**. When shopping, the cautious consumer looks for items that will save him or her money. Later in life, if you decide to own your own home, you will need to keep track of your property taxes.

Exchange rates, unit pricing, and property taxes are the focus of this activity.

Example

How much did Susan spend in the United States if the exchange rate when she converted her \$500 was Can \$1.00 = US \$0.6547 and the exchange rate when she returned was Can \$1.00 = US \$0.6425?

a. Express your answer in American dollars.

b. Express your answer in Canadian dollars.

Solution

a. Convert Can \$500 to American dollars.

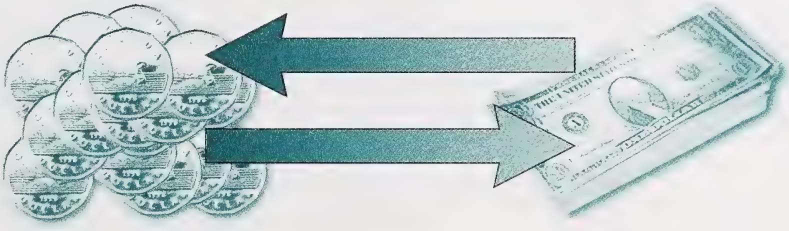
$$\begin{aligned}\text{Can }\$1.00 &= \text{US }\$0.6547\\ \text{Can }\$500 &= 500\times\text{US }\$0.6547\\ &= \text{US }\$327.35\end{aligned}$$

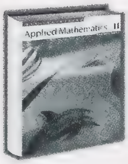
Because Susan left with US \$327.35 and returned with US \$75.00, she spent $\$327.35 - \$75.00 = \text{US }\$252.35$.

b. Convert US \$75 to Canadian dollars.

$$\begin{aligned}\text{US }\$0.6425 &= \text{Can }\$1.00\\ \frac{\text{US }\$0.6425}{0.6425} &= \frac{\text{Can }\$1.00}{0.6425}\\ \text{US }\$1.00 &= \frac{\text{Can }\$1.00}{0.6425}\\ 75\times\text{US }\$1.00 &= 75\times\frac{\text{Can }\$1.00}{0.6425}\\ \text{US }\$75.00 &= \text{Can }\$116.73\end{aligned}$$

Because Susan started with Can \$500 and returned with Can \$116.73, she spent $\$500.00 - \$116.73 = \text{Can }\$383.27$.



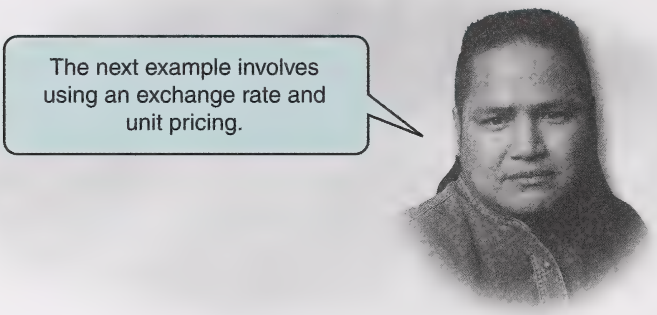


Turn to page 236 of the textbook and read the introductory paragraphs of Tutorial 5.3, "Expenses"; then work through "Example 1: Foreign exchange."

1. Answer the following exercises on pages 238 and 241 of the textbook.

  a. exercise 4 of "Discussing the Ideas"
  b. exercises 8, 9, and 11 of "Exercises: Checking Your Skills"

Compare your responses with the suggested answers in the Appendix, Activity 3, pages 76–77.


The next example involves using an exchange rate and unit pricing.

Example

While Susan and her family were in California, they stopped in Merced and purchased 3.5 pounds of bananas for US \$2.42. Back in her home town in Canada, 2 pounds of bananas would have cost Can \$1.96 on the same day. If the exchange rate that day was $\text{US }\$1.00=\text{Can }\$1.5525$, compare the cost of bananas in Merced to the cost of bananas in Susan's home town.

Solution

Find the unit price of bananas in Merced.

$$\begin{aligned}\text{Unit price} &= \frac{\text{US }\$2.42}{3.5\text{ pounds}}\\ &= \text{US }\$0.69/\text{pound}\end{aligned}$$

Convert to Canadian dollars.

$$\begin{aligned}\text{US }\$1.00 &= \text{Can }\$1.5525\\ 0.69\times\text{US }\$1.00 &= 0.69\times\text{Can }\$1.5525\\ \text{US }\$0.69 &= \text{Can }\$1.07\end{aligned}$$

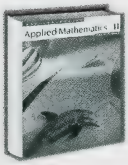
In Merced, bananas costs Can \$1.07/pound.

Find the unit price of bananas in Susan's home town.

$$\text{Unit price} = \frac{\text{Can } \$1.96}{2 \text{ pounds}}$$
$$= \text{Can } \$0.98/\text{pound}$$

In Susan's home town, 1 pound of bananas costs Can $0.98, which is Can $0.08 less, per pound, than in Merced, California.

For items sold in grams, such as dry cereal, the unit price is commonly given for 100 g. For example, a 500-g box selling for $3.00 is described as $0.60 for 100 g. This unit price is easier for the consumer to relate to than $0.0060 for 1 g. Similarly, for items sold by the millilitre, such as toothpaste, the unit price is commonly given for 100 mL. You will practise unit pricing in the next part of this activity.



Turn to page 237 of the textbook and work through "Example 2: Compare Prices Using Unit Pricing."

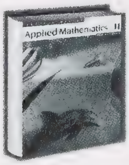
2. Answer exercises 1.a., 1.c., and 2 of "Exercises: Checking Your Skills" on page 239 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 3, pages 77–78.

Darien's mother is a member of the town council. They are currently reviewing the budget and are about to set the **mill rate**. The mill rate is used to determine property taxes. One mill is $\frac{1}{1000}$ of each dollar of the assessed value of a property. The following formula is used to determine property taxes.

$$\text{Property taxes} = \frac{\text{Assessed value} \times \text{Mill rate}}{1000}$$

To see how mill rate is used to determine property taxes, view the segment titled *Property Tax* on the Applied Mathematics 20 CD.



Turn to page 238 of the textbook and work through "Example 3: Calculate the Property Tax."

You can also use the property tax formula to determine the mill rate if you know the taxes and the assessed value.

Example

The town council knows that the assessed value of all property in their town is \$275 000 000. They need to raise \$11 447 500 to cover their budget for the next 12 months. From past experience, they realize that they will likely not collect 5% of the property taxes. At what level should the council set the mill rate to ensure they raise at least \$11 447 500 in property taxes? Round your answer to 2 decimal places.

Solution

95% of total property taxes possible $= \$11\,447\,500$

$$\begin{aligned} 0.95 \times \text{Property taxes} &= \$11\,447\,500 \\ \text{Property taxes} &= \frac{\$11\,447\,500}{0.95} \\ &= \$12\,050\,000 \end{aligned}$$

Use the property tax formula.

$$\begin{aligned} \text{Property taxes} &= \frac{\text{Assessed value} \times \text{Mill rate}}{1000} \\ \$12\,050\,000 &= \frac{\$275\,000\,000 \times \text{Mill rate}}{1000} \\ \$12\,050\,000 &= \$275\,000 \times \text{Mill rate} \\ \text{Mill rate} &= \frac{\$12\,050\,000}{\$275\,000} \\ &\doteq 43.82 \text{ mills} \end{aligned}$$

The council should set the mill rate at approximately 43.82 mills.

3. Turn to page 240 of the textbook and answer exercises 5 and 6 of "Exercises: Checking Your Skills."

Compare your responses with the suggested answers in the Appendix, Activity 3, pages 78–79.

LOOKING BACK

In this activity you examined exchange rates, unit prices, and mill rates. These are financial concerns that may affect your budget when you are living on your own.

4. Turn to page 241 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 3, page 79.

ACTIVITY 4

Keeping Track of Money

Carl is working full time as a website designer. His paycheque is deposited directly into his chequing account once a month.

Each month, the bank sends Carl a financial statement of all the transactions that were cleared through his chequing account over the past month. This statement helps Carl keep track of his deposits and withdrawals.

Carl has a personal chequebook and a personal transaction record book for his account. Every time Carl makes a deposit or withdrawal, he records the transaction into his personal record book. When Carl gets his statement from the bank, he can **reconcile** it with his personal record book and correct any errors he or his bank has made.

Example

This morning, in the mail, Carl received the bank statement for his chequing account. He is about to reconcile his account by comparing the bank statement against his record book. Help Carl reconcile his chequing account.

Carl Ludy
123 Avenue A
Valley Springs, SK
S9A 9Z9

Account No. 12-3456
Period Ending 23/02/01

Date	Description	Debits	Credits	Balance
Jan 23	Balance Forward			$1300.43
Jan 25	Cheque 143	53.14		1247.29
Jan 28	Withdrawal	100.00		1147.29
Jan 30	Deposit			
	Famous Fashions		1800.50	2947.79
Jan 31	Interest		1.12	2948.91
Feb 10	Withdrawal	300.00		2648.91
Feb 22	ABM Bill Payment			
	Vista Visa	1341.12		1307.79
	Service Charges	12.00		1295.79

Date	No.	Description	Debit	Credit	√	Balance
		Balance forward				1300.43
Jan. 23	143	Farmer's Foods	53.14			1247.29
Jan. 30		January paycheque		1800.50		3047.79
Feb. 10		Withdrawal	300.00			2747.79
Feb. 22		Visa payment	1341.12			1406.67
Feb. 24	144	Lung Association	10.00			1396.67

Throughout Tutorial 5.4, the textbook shows the Credit column to the left of the Debit column in the record book. Normally, the Debit column appears to the left of the Credit column in these books. Throughout this Student Module Booklet, the Debit column will be to the left of the Credit column. You should make the necessary adjustment as well.

Solution

Step 1: Check off all transactions in Carl's record book that appear in the bank statement. (See the transaction page in Step 2.)

Step 2: Record all transactions that appear in the bank statement that Carl has not yet included in his record book. Adjust the balance after each entry, and don't forget to check off these transactions in the record book.

Date	No.	Description	Debit	Credit	✓	Balance
		Balance forward			✓	1300.43
Jan. 23	143	Farmer's Foods	53.14		✓	1247.29
Jan. 30		January paycheque		1800.50	✓	3047.79
Feb. 10		Withdrawal	300.00		✓	2747.79
Feb. 22		Visa payment	1341.12		✓	1406.67
Feb. 24	144	Lung Association	10.00			1396.67
Jan. 28		**Withdrawal**	**100.00**		✓	**1296.67**
Jan. 31		**Interest**		**1.12**	✓	**1297.79**
Feb. 22		**Service charges**	**12.00**		✓	**1285.79**

Step 3: Write down the final balance from the bank statement. Add any deposits that you did not check off in the record book, and subtract any cheques or withdrawals that you did not check off in the record book.

$$\begin{aligned}\text{Bank reconciliation} &= \text{Statement balance} + \text{Deposits} - \text{Cheques and withdrawals}\\ &= \$1295.79 - \$10.00\\ &= \$1285.79\end{aligned}$$

Step 4: If the amount in Step 3 is not the same as the balance shown on the record book, check for arithmetical errors.

For Carl, $1285.79 is the balance in his record book. Everything is correct!

Turn to page 244 of the textbook and read the introductory paragraphs of Tutorial 5.4, "Keeping Track of Money."

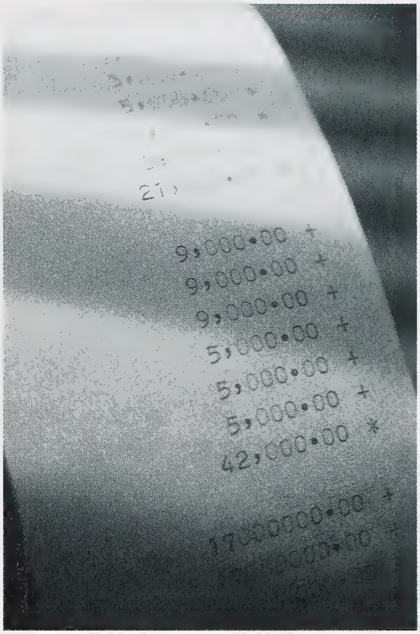
1. Complete exercises 1 to 4 of "Investigation 1: Reconciling a Bank Statement" on page 245 of the textbook. Use the following transaction record.

Date	No.	Description	Debit	Credit	✓	Balance
		Balance forward				523.14
Sep. 17		Withdrawal	50.00			473.14
Sep. 18	34	The Electronic Store	62.18			410.96
Sep. 29		Deposit		341.60		751.56
Oct. 3	35	Clothing Express	137.46			614.10
Oct. 4		Withdrawal	40.00			574.10
Oct. 12		Withdrawal	40.00			534.10
Oct. 15	36	Bike and Skate	83.12			450.98

2. Answer the following exercises on pages 247 and 248 of the textbook.

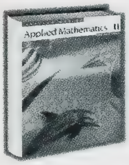
   a. exercises 1 and 2 of "Discussing the Ideas"
   b. exercises 1 and 2 of "Exercises: Checking Your Skills"

Compare your responses with the suggested answers in the Appendix, Activity 4, pages 79–81.



Just as people reconcile their chequebooks with their bank statements, businesses, too, reconcile their cash-register receipts. Employees use the cash register to determine the total sales made during the day. They then reconcile the cash, cheques, credit-card transactions, and debit-card transactions with this total.

For additional discussion on cash-register receipts, view the segment titled *Balance a Cash Register* on the Applied Mathematics 20 CD.



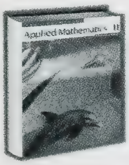
3. Turn to pages 245 and 246 of the textbook and answer exercises 1 to 10 of "Investigation 2: Balancing the Till."

4. Turn to pages 247 to 249 of the textbook and answer the following.

   a. exercise 3 of "Discussing the Ideas"
   b. exercises 3 and 4 of "Exercises: Checking Your Skills"

Compare your responses with the suggested answers in the Appendix, Activity 4, pages 81–83.

LOOKING BACK



In this activity you reconciled bank accounts and cash-register receipts.

5. Turn to page 249 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 4, page 84.

ACTIVITY 5

Interest

Lisa has been working part time for the past year while living at home and going to school. As a result, she has managed to save $2500. Because Lisa plans to attend university or community college, she decided to invest the money in a two-year guaranteed investment certificate (GIC).

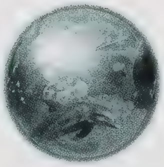
A GIC is a conservative investment that normally bears higher interest than most savings accounts. The financial institution that issues the certificate guarantees a fixed interest rate for a specified period of time. For example, if the certificate says you will receive 5% per year over two years, that is precisely what you will receive. With a GIC, though, you cannot cash it in before the end of the term without penalty.

Canada Savings Bonds are very similar to GICs. The government of Canada guarantees a Canada Savings Bond just as a bank guarantees a GIC.

Canada Saving Bonds have two advantages over GICs:

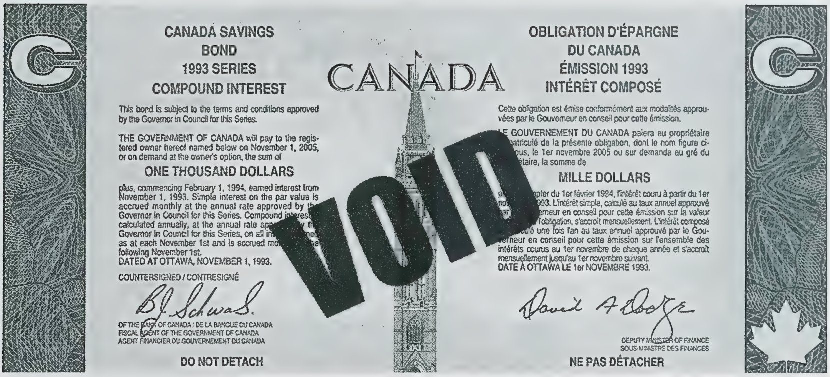
- Canada Savings Bonds are purchased for a set term, but are cashable anytime with interest earned up to, but not including, the month in which they are redeemed. GICs can be purchased for various lengths of time but cannot be cashed before the maturity date without penalty.

- The government of Canada guarantees a minimum interest rate. However, if the market conditions warrant, the government may adjust the rate upward during the term of the bonds so holders of the bonds do not cash them before maturity.



If you have access to the Internet, additional information concerning Canada Savings Bonds is available at the following website:

http://csb.gc.ca



CANADA SAVINGS
BOND
1993 SERIES
COMPOUND INTEREST

This bond is subject to the terms and conditions approved by the Governor in Council for this Series.

THE GOVERNMENT OF CANADA will pay to the registered owner hereof named below on November 1, 2005, or on demand at the owner's option, the sum of

ONE THOUSAND DOLLARS

plus, commencing February 1, 1994, earned interest from November 1, 1993. Simple interest on the par value is accrued monthly at the annual rate approved by th[illegible] Governor in Council for this Series. Compound interest [illegible] calculated annually, at the annual rate app[illegible] th[illegible] Governor in Council for this Series, on all in[illegible] as at each November 1st and is accrued mo[illegible] following November 1st.
DATED AT OTTAWA, NOVEMBER 1, 1993.

COUNTERSIGNED / CONTRESIGNÉ

OF THE BANK OF CANADA / DE LA BANQUE DU CANADA
FISCAL AGENT OF THE GOVERNMENT OF CANADA
AGENT FINANCIER DU GOUVERNEMENT DU CANADA

DO NOT DETACH

CANADA

VOID

OBLIGATION D'ÉPARGNE
DU CANADA
ÉMISSION 1993
INTÉRÊT COMPOSÉ

Cette obligation est émise conformément aux modalités approuvées par le Gouverneur en conseil pour cette émission.

LE GOUVERNEMENT DU CANADA paiera au propriétaire [illegible]atriculé de la présente obligation, dont le nom figure ci-[illegible]ous, le 1er novembre 2005 ou sur demande au gré du [illegible]étaire, la somme de

MILLE DOLLARS

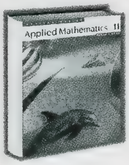
p[illegible]pter du 1er février 1994, l'intérêt couru à partir du 1er no[illegible]993. L'intérêt simple, calculé au taux annuel approuvé [illegible]erneur en conseil pour cette émission sur la valeur [illegible] l'obligation, s'accroît mensuellement. L'intérêt composé [illegible]é une fois l'an au taux annuel approuvé par le Gouverneur en conseil pour cette émission sur l'ensemble des intérêts courus au 1er novembre de chaque année et s'accroît mensuellement jusqu'au 1er novembre suivant.
DATE À OTTAWA LE 1er NOVEMBRE 1993.

David A Dodge

DEPUTY MINISTER OF FINANCE
SOUS-MINISTRE DES FINANCES

NE PAS DÉTACHER

Many GICs and bonds bear **simple interest**; other bonds and investments bear **compound interest**. In this activity, you will investigate both types of interest.



Turn to page 250 of the textbook and read the introductory paragraphs of Tutorial 5.5, "Interest."

1. Answer exercises 1 to 5 of "Investigation 1: Simple Interest" on page 250 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 5, pages 84–85.

The formula for simple interest is

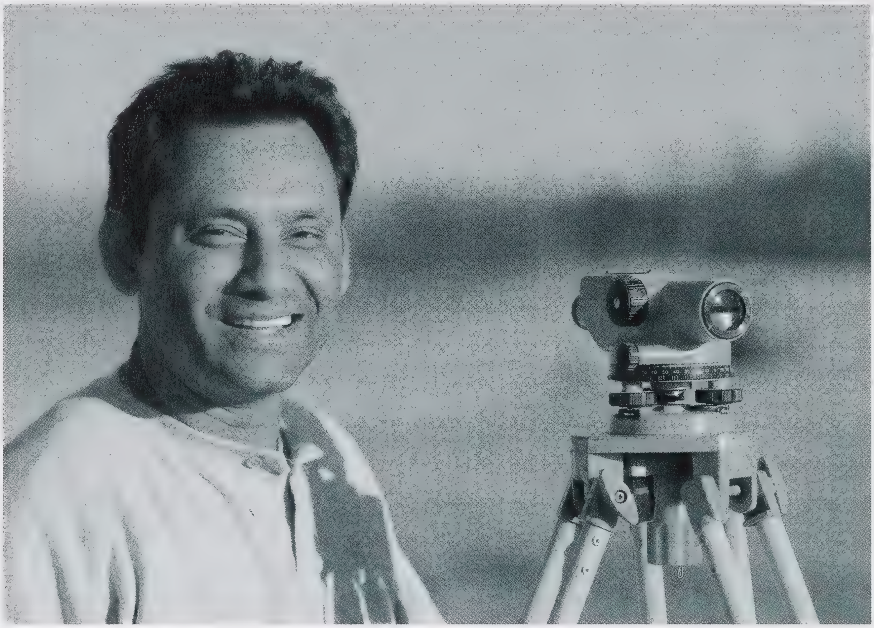
$$I = Prt$$

In this formula, I is the interest earned, P is the principal (or amount invested), r is the annual interest rate, and t is the time (in years).

Investments held less than a year, such as a 30-day or 60-day GIC, generally bear simple interest. Be careful when you are using the simple interest formula in these cases. Because the value of t is in years, you must convert days or months to years.

Example

Rahim has invested \$4500 in a 30-day GIC bearing 3.5% annual interest. Calculate the amount he will have when the GIC matures.



Solution

Use the formula $I = Prt$.

$P = 4500, r = 0.035$, and $t = \frac{30}{365}$

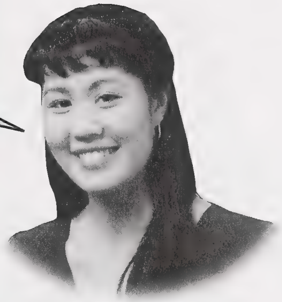
$$\begin{aligned} \therefore\ I &= Prt \\ &= 4500(0.035)\left(\frac{30}{365}\right) \\ &= 12.95 \end{aligned}$$

The investment will earn \$12.95 in interest.

The amount, *A*, is the principal plus interest.

$$\begin{aligned} \therefore\ A &= \$4500 + \$12.95 \\ &= \$4512.95 \end{aligned}$$

Rahim will have \$4512.95 when the GIC matures.



You can also use the simple interest formula to calculate the principal, the annual interest rate, or the length of the term (time).

Example

How much must be invested in a 180-day GIC bearing an annual interest rate of 3.75% in order to earn $200 in interest?

Solution

Solve the interest formula for P, the amount invested.

$$I = Prt$$

$$Prt = I$$

$$\frac{Prt}{rt} = \frac{I}{rt} \quad \longleftarrow \text{Divide both sides by } rt \text{ to isolate } P.$$

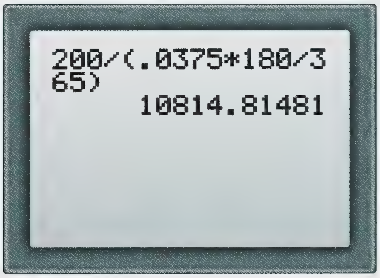
$$P = \frac{I}{rt}$$

$I = 200$, $r = 0.0375$, and $t = \frac{180}{365}$

$$\therefore\ P = \frac{I}{rt}$$

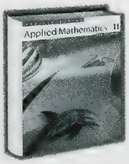
$$= \frac{200}{0.0375\left(\frac{180}{365}\right)}$$

$$= 10\,814.81$$



```
200/(.0375*180/3
65)
         10814.81481
```

You must invest $10 814.81 to earn $200 in interest.



Turn to page 251 of the textbook and work through "Example 1: Calculate the Amount for Simple Interest."

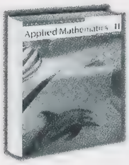
2. Rewrite the formula for simple interest in the form you would use to solve for each variable given.

   a. r **b.** t

3. Answer exercise 1 of "Exercises: Checking Your Skills" on page 255 of the textbook.

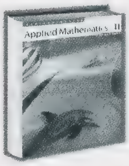
Compare your responses with the suggested answers in the Appendix, Activity 5, page 85.

For long-term investments, interest is often compounded. The interest is added to the principal at the end of each interest period, and this total amount becomes the principal for the next interest period. In the next part of this activity, you will explore compound interest and how to use the financial features of your graphing calculator to determine the accumulated amount.



4. Turn to pages 252 and 253 of the textbook and complete exercises 1 to 10 of "Investigation 2: Compound Interest."

Compare your responses with the suggested answers in the Appendix, Activity 5, pages 86–88.



Turn to page 253 of the textbook and read the summary following "Investigation 2: Compound Interest."

In the summary, you are given the formula for compound interest, $A = P(1+i)^n$. In this formula, A is the accumulated amount (or future value) of the investment, P is the principal (or present value) of the investment, i is the interest rate per period, and n is the number of interest periods.

The relationship between i and the annual interest rate, r, is

$$i = \frac{r}{\text{number of interest periods per year}}$$

The relationship between n and the number of years, t, is

$$n = t \times \text{the number of interest periods per year}$$

The most common compounding periods are given in the following table.

Compounding Period	Number of Compounding Periods Per Year, n	Interest Rate Per Period, i
annually	1	r
semi-annually	2	$\frac{r}{2}$
quarterly	4	$\frac{r}{4}$
monthly	12	$\frac{r}{12}$
daily	365	$\frac{r}{365}$

Study the following examples to discover how to apply the compound interest formula.

Example

Jerritt deposited \$1000 into an account earning 3% interest, compounded annually.

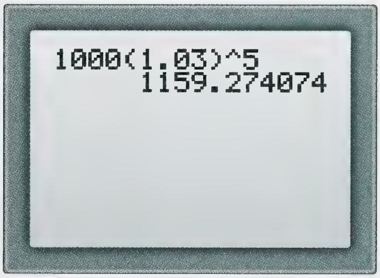
a. Determine the balance in his account after 5 years.
b. How much more would Jerritt have if the interest were compounded quarterly?

Solution

a. Use the compound interest formula, $A = P(1+i)^n$.

$P = 1000, i = 0.03$, and $n = 5$

$$\begin{aligned} \therefore\ A &= P(1+i)^n \\ &= 1000(1+0.03)^5 \\ &= 1000(1.03)^5 \\ &= 1159.27 \end{aligned}$$



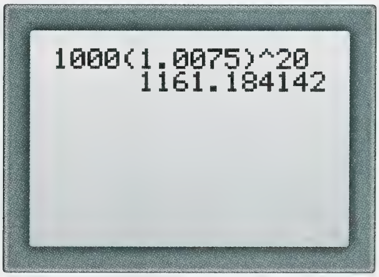
```
1000(1.03)^5
      1159.274074
```

Jerritt will have \$1159.27 in his account.

b. Because the interest is calculated 4 times a year, the interest rate for every three-month period is $\frac{0.03}{4} = 0.0075$ and the number of interest periods in 5 years is $4 \times 5 = 20$.

$\therefore\ P = 1000,\ i = 0.0075$, and $n = 20$

$$\begin{aligned} \therefore\ A &= P(1+i)^n \\ &= 1000(1+0.0075)^{20} \\ &= 1000(1.0075)^{20} \\ &= 1161.18 \end{aligned}$$



```
1000(1.0075)^20
      1161.184142
```

If the interest were compounded quarterly, Jerritt would have \$1161.18 in his account. This amount is $\$1161.18 - \$1159.27 = \$1.91$ more than he would have for an annual compounding period.

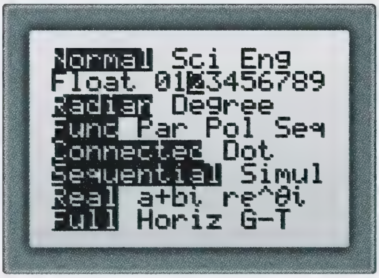
You can also use one of the financial features of your graphing calculator to solve compound interest problems. You will use the TVM solver. TVM means “Time Value of Money.”

Example

Comandra invests $2500 in an account bearing an annual interest rate of 5%, compounded semi-annually. Use your graphing calculator to determine what her investment will be worth after 5 years.

Solution

To get your calculator to round answers to the nearest cent, press MODE and select “2” for the number of decimal places in the answer.

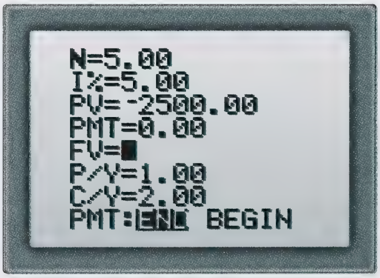


```
Normal Sci Eng
Float 0123456789
Radian Degree
Func Par Pol Seq
Connected Dot
Sequential Simul
Real a+bi re^θi
Full Horiz G-T
```

To access the financial features, press the following:

2nd [FINANCE] 1 (1:TVM Solver…)

Enter the values shown on the following display.

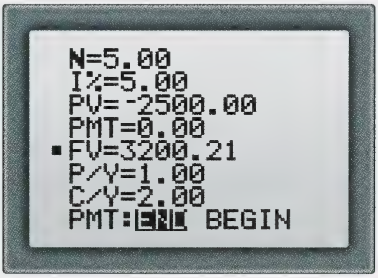


```
N=5.00
I%=5.00
PV=-2500.00
PMT=0.00
FV=
P/Y=1.00
C/Y=2.00
PMT:END BEGIN
```

Each line in the display represents the following:

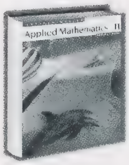
- N is the number of years the principal is invested (5 years).
- I% is the annual interest rate (5%).
- PV is the present value or principal invested ($2500). Because the principal is deposited into the account and not an amount received by the person making the investment, it is negative. Payments made are negative; amounts received are positive.
- FV refers to the future value of the investment. This is what you want to determine in this problem. For the time being, do not enter anything here; it will be calculated later.
- P/Y is the number of deposits or payments per year. Only one payment was made, the original deposit.
- C/Y is the number of times the interest is calculated per year. In this problem the interest is calculated semi-annually (twice a year).

Use the arrow keys to position the cursor on the FV line. This will tell the calculator that it is the FV value that must be calculated. Then press ALPHA [SOLVE].

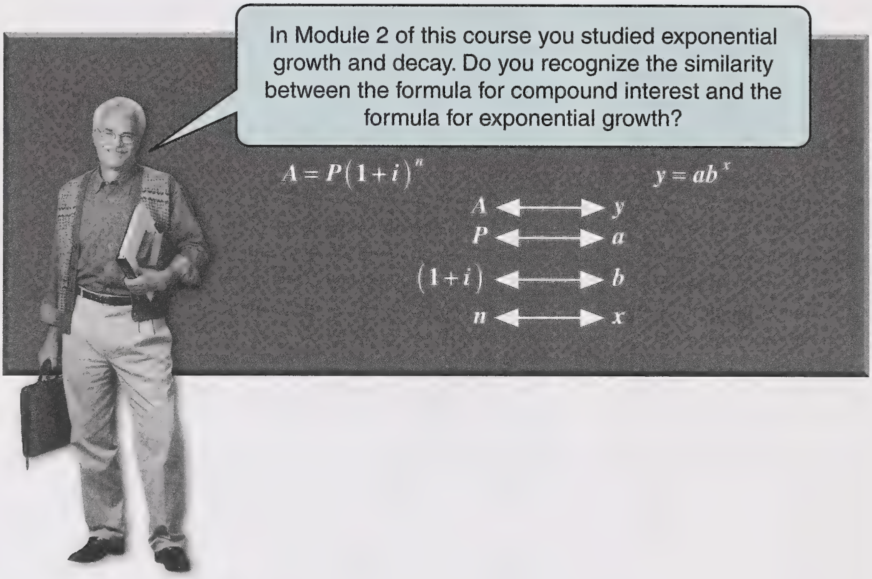


```
 N=5.00
 I%=5.00
 PV=-2500.00
 PMT=0.00
▪FV=3200.21
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

The calculator shows that Comandra will have $3200.21 in the account after 5 years.



Turn to pages 254 and 255 of the textbook and work through "Example 2: Determine the Accumulated Amount."


In Module 2 of this course you studied exponential growth and decay. Do you recognize the similarity between the formula for compound interest and the formula for exponential growth?
$A = P(1+i)^n$
$y = ab^x$
$A \longleftrightarrow y$
$P \longleftrightarrow a$
$(1+i) \longleftrightarrow b$
$n \longleftrightarrow x$

Example

Compare the graph of the exponential growth function $y = 1000(1.01)^x$ with the graph of the amount of money accumulated year after year from an initial investment of $1000 at 12%, compounded monthly.

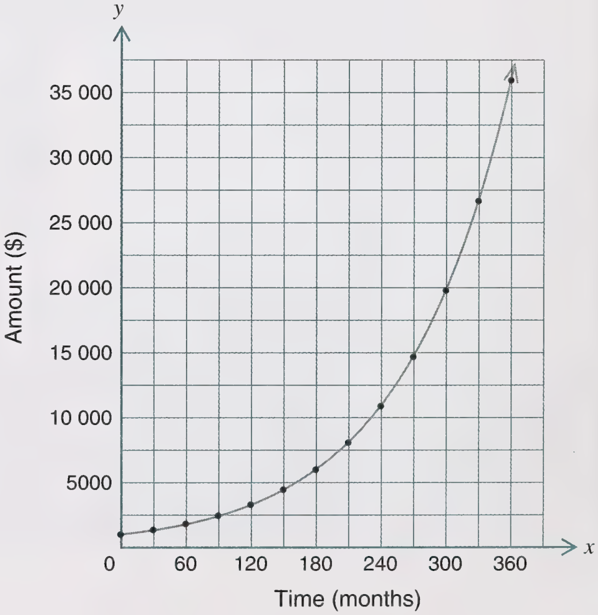
Solution

$$A = P(1+i)^n$$

$$A = 1000\left(1 + \frac{0.12}{12}\right)^n$$

$$A = 1000(1.01)^n$$

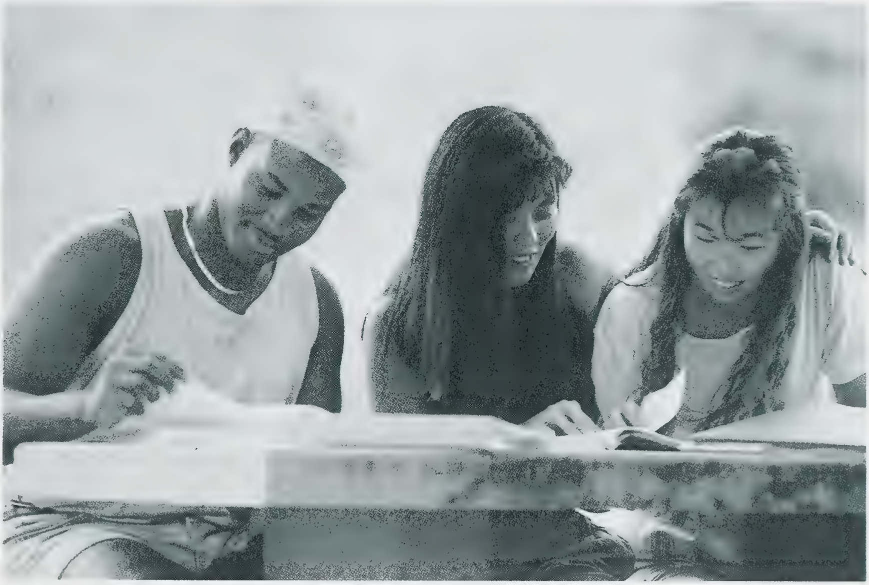
The graphs of the two functions are given on the right.



The interest graph is represented by the dots, one every 30 months (or 2.5 years). The exponential growth function is represented by the line graph. The major difference between the two graphs is that the interest graph is discrete (made up of dots, actually one dot per month), whereas the exponential graph is continuous.

5. Turn to pages 255 and 256 of the textbook and answer exercises 2, 3.b., 4.a., and 5 of "Exercses: Checking Your Skills."

Compare your responses with the suggested answers in the Appendix, Activity 5, pages 88–89.



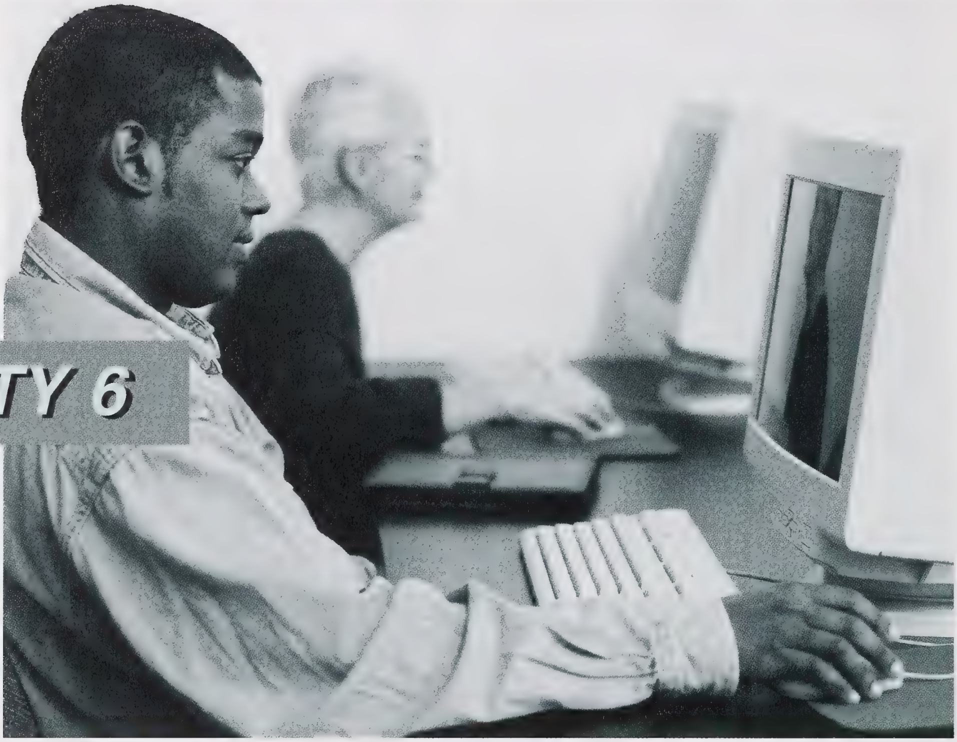
LOOKING BACK

In this activity you explored simple interest and compound interest problems, using formulas and the TVM Solver on your graphing calculator in your exploration.

6. Turn to page 257 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 5, page 89.

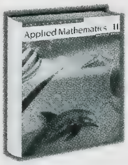
ACTIVITY 6



Computer Lab: Compound Interest

You can use the power of computer spreadsheets to analyse problems in compound interest. One advantage spreadsheets have over graphing calculators is the ease at which spreadsheets can create tables. You can use these tables to see not only what the future values of investments earning compound interest will be, but to see the intermediate values of these investments—the values at the end of each interest period. Another advantage of using spreadsheets is the ease with which you can modify a table to accommodate a new problem—simply by entering new values for the principal, interest, and/or the number of compounding periods. Once you make these changes, the spreadsheet automatically updates the values in the tables.

The steps you will follow to create a spreadsheet for analysing compound interest are outlined in the textbook. For programming specifics, such as how to format a cell to show currency, consult the user's guide that accompanies the software.



1. Turn to pages 259 and 260 of the textbook and answer exercises 1 to 10 of Tutorial 5.6, “Computer Lab: Compound Interest.”

Compare your responses with the suggested answers in the Appendix, Activity 2, pages 90–94.

In the preceding exploration, you examined compound interest problems with a variety of compounding periods. In the next example you will determine the effect different compounding periods have on the interest you earn on an investment, even though the annual interest rate is stated as the same percent.

You are about to determine the **effective annual rate of interest**. To calculate the effective annual rate of interest, first find the interest earned in one year. Then find the annual rate of interest that will generate this amount. This rate is the effective annual rate of interest.

Example

Giorgio deposits his hard-earned savings into an account bearing 5% annual interest. Determine the effective annual rate of interest if the interest is compounded in the following ways.

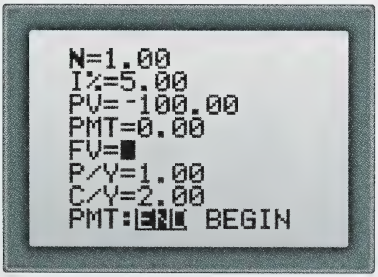
a. annually **b.** semi-annually **c.** monthly

Solution

a. If the interest is compounded annually, the effective annual rate is simply the stated rate, 5%. Every $100 invested earns $5 in interest.

b. Determine what happens to every $100 invested over one year using the TVM Solver on your graphing calculator. Press 2nd [FINANCE] 1 to access the TVM Solver.

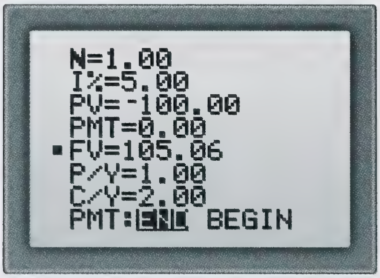
Enter the values shown in the following display.



```
N=1.00
I%=5.00
PV=-100.00
PMT=0.00
FV=■
P/Y=1.00
C/Y=2.00
PMT:END BEGIN
```

Remember: When using the TVM Solver, it is a good idea to have your calculator set up so it shows only 2 decimal places.

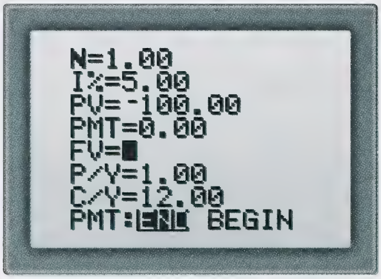
To determine the accumulated amount, the future value after one year, position the cursor at FV and press ALPHA [SOLVE].



```
 N=1.00
 I%=5.00
 PV=-100.00
 PMT=0.00
▪FV=105.06
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

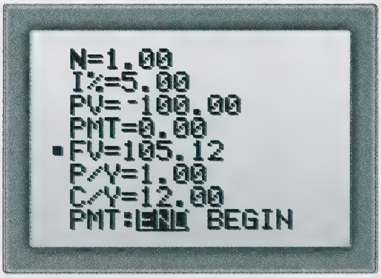
This time, there is more than $5.00 of interest earned. The interest the $100 invested earned over a year when compounded semi-annually is $5.06. Therefore, the effective annual rate is 5.06% for 5%, compounded semi-annually.

c. Determine what happens to every $100 invested over one year. Use the TVM Solver on your graphing calculator, and enter the values shown in the following display.



```
 N=1.00
 I%=5.00
 PV=-100.00
 PMT=0.00
 FV=
 P/Y=1.00
 C/Y=12.00
 PMT:END BEGIN
```

To determine the accumulated amount, the future value after one year, position the cursor at FV and press ALPHA [SOLVE].



```
 N=1.00
 I%=5.00
 PV=-100.00
 PMT=0.00
▪FV=105.12
 P/Y=1.00
 C/Y=12.00
 PMT:END BEGIN
```

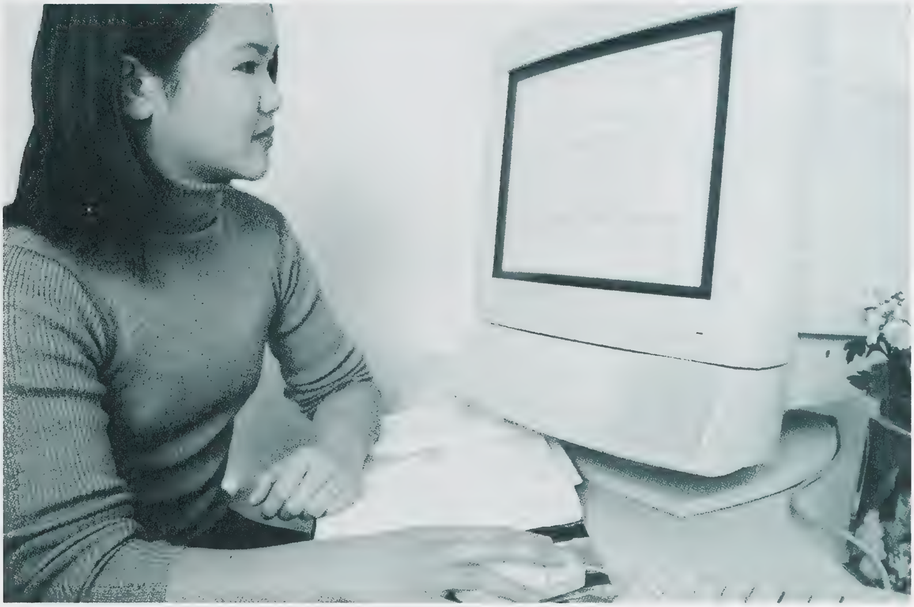
Again, there is more than $5.00 of interest earned. The interest the $100 invested earned over a year when compounded monthly is $5.12. Therefore, the effective annual rate is 5.12% for 5%, compounded monthly.

Turn to pages 260 and 261 of the textbook and work through "Example: Determine the Effective Annual Rate of Interest."

2. Answer the following exercises on pages 261 and 262 of the textbook.

- **a.** exercises 1 to 3 of "Discussing the Ideas"
- **b.** exercises 1, 2, 4.a., and 5 of "Exercises: Checking Your Skills"

Compare your responses with the suggested answers in the Appendix, Activity 6, pages 95–98.



LOOKING BACK

In this activity you explored compound interest using spreadsheets. You also explored effective annual rates for investments with compounding periods shorter than a year.

3. Turn to page 263 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 6, pages 98–99.

ACTIVITY 7

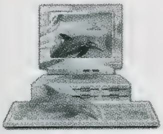
Computer Lab: Annuities

To buy a car, Jennifer took out a loan from her bank. She agreed to make monthly payments of $400 until the loan is paid off. These loan payments, as a whole, can be considered to be an **annuity**.

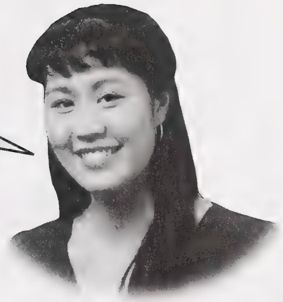
An annuity is a financial agreement that involves payments at regular intervals. A series of loan payments is just one type of annuity.

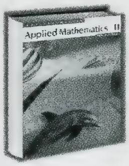
Another type of annuity consists of simply making regular deposits into a bank account. If, for example, you deposit $100 into your savings account on the first day of each month, those deposits can be thought of as an annuity.

A third type is when an individual turns over a lump sum to a bank or trust company. The bank or trust company then pays the individual equal amounts, usually every month, until the lump sum and the interest it earns is reduced to zero. This tactic is used to spread out income over time. Often, RRSPs are converted into annuities when people retire so they are assured of a regular income.



In this activity, you will explore examples of annuities, like paying off a loan and investing regularly. In your investigation you will use spreadsheet programs and the TVM Solver on your graphing calculator.





Turn to page 264 of the textbook and read the introductory paragraphs of Tutorial 5.7, "Computer Lab: Annuities."

1. Answer exercises 1 to 5 of Tutorial 5.7 "Computer Lab: Annuities," on pages 264 and 265 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 7, pages 99–101.

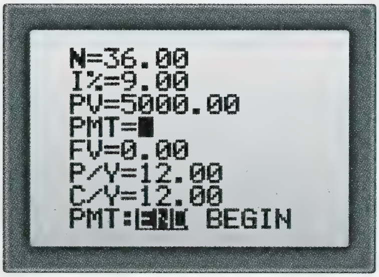
In the next example you will use the TVM Solver to determine the monthly payments necessary to pay off a loan.

Example

Serge and Alberta borrowed $5000 from the bank to buy furniture for their new apartment. Their loan payments will be at the end of each month for 3 years until the loan is paid off. If the bank is charging 9% annual interest, compounded monthly, determine their monthly payments.

Solution

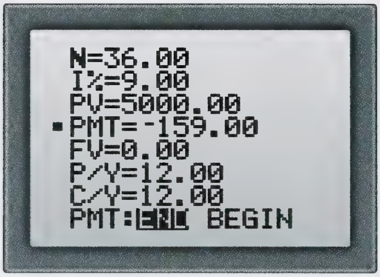
Press 2nd [FINANCE] 1 (1:TVM Solver…) to access the TVM Solver; then enter the values as shown.



```
N=36.00
I%=9.00
PV=5000.00
PMT=■
FV=0.00
P/Y=12.00
C/Y=12.00
PMT:END BEGIN
```

Because there are 36 payments over 3 years, $N = 36$. Because Serge and Alberta received $5000 from the bank, the present value (PV) is positive. When the loan is paid out, $FV = 0$. There are 12 payments per year, and the interest is compounded 12 times a year; therefore, $P/Y = 12$ and $C/Y = 12$.

After you have entered the appropriate values, position the cursor at PMT and press ALPHA [SOLVE].



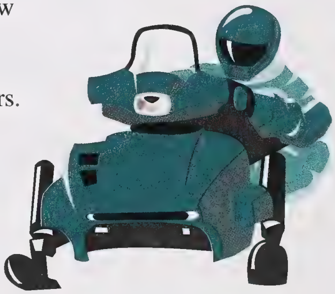
```
 N=36.00
 I%=9.00
 PV=5000.00
▪PMT=-159.00
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

The monthly payment is \$159.00. **Note:** Because the payment is money paid out, it is negative.

In the next example, you will use the TVM Solver to determine the total cost of a loan of \$3800. When you work through this example, enter the amount of the loan as $\text{PV} = 3800$. The present value should be positive because it is money the borrower **receives** from the bank. The loan payments will be negative because they are **paid** to the bank.

Example

Jade borrows \$3800 from her bank to purchase a new snowmobile. The terms offered by the bank are an annual interest rate of 8%, compounded monthly. Jade's monthly payments are to be made over 3 years.



a. What is Jade's monthly payment?

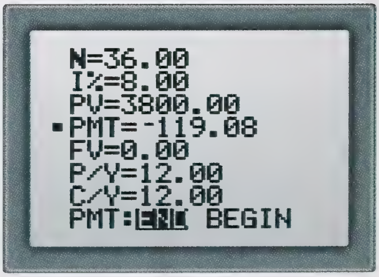
b. What is the total cost of the loan?

c. What is the finance charge?

Solution

a. Using the TVM Solver on your graphing calculator, enter the known values and determine the monthly payment.

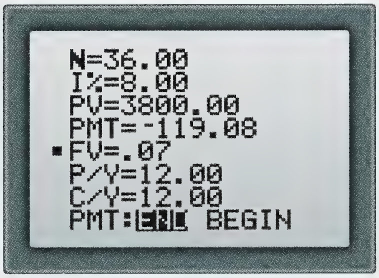
Jade's monthly payment is \$119.08.



```
 N=36.00
 I%=8.00
 PV=3800.00
▪PMT=-119.08
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

b. The total cost of the loan is the total amount paid by Jade. For 35 payments, Jade's monthly payment is \$119.08. For the 36th payment, an adjustment will need to be made due to rounding (as you did with the last payment on the spreadsheet in exercise 1). Jade will either pay a little more or a little less than \$119.08.

Determine the adjustment to the last payment using the TVM Solver. Simply re-enter the monthly payment of \$119.08 and determine the future value, FV. **Note:** If you do not re-enter the payment, the calculator will use the internal, unrounded payment from part a., thus giving a future value of \$0.00.



```
 N=36.00
 I%=8.00
 PV=3800.00
 PMT=-119.08
■FV=.07
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

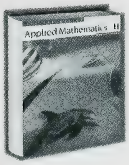
When FV is positive, your account is positive. If FV is negative, your account is negative, meaning you still owe.

Because the future value shows an overpayment on the loan of \$0.07 (or 7¢), the final payment will only be \$119.01.

$$\begin{aligned}\therefore \text{ Total cost of loan} &= 35 \times \$119.08 + \$119.01 \\ &= \$4167.80 + 119.01 \\ &= \$4286.81\end{aligned}$$

c. The finance charge is the difference between the cost of the loan and the loan.

$$\begin{aligned}\therefore \text{ Finance charge} &= \$4286.81 - \$3800.00 \\ &= \$486.81\end{aligned}$$

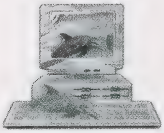


2. Turn to pages 268 to 270 of the textbook and answer the following.

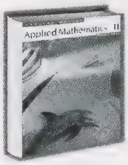
a. exercises 2 and 3 of "Discussing the Ideas"
Note: For exercise 2, use \$20 000 as the amount of the load.

b. exercises 1, 2, 3, 4, 5.b., 6, and 7 of "Exercises: Checking Your Skills"
Note: For exercise 6, use the information from exercise 5.b. only.

Compare your responses with the suggested answers in the Appendix, Activity 7, pages 101–105.



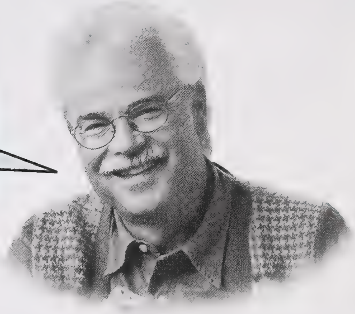
In the next part of this activity, you will use a spreadsheet to explore how you can harness the power of compound interest to ensure a secure financial future. Provided you begin saving early enough in life, even small, regular investments over time will grow to substantial amounts.

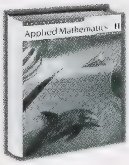


3. Turn to page 265 of the textbook and answer exercises 6 to 11 of Tutorial 5.7, "Computer Lab: Annuities."

Compare your responses with the suggested answers in the Appendix, Activity 7, pages 105–107.

You can also use the TVM Solver on your graphing calculator to explore compound interest problems involving regular deposits.





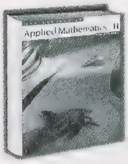
Turn to page 267 and 268 of the textbook and work through "Example 2: Compare Amount with Principal." Notice that "BEGIN" has been highlighted in the last line of the TVM Solver. This is because deposits are made at the beginning of each month.

4. Answer exercise 8 of "Exercises: Checking Your Skills" on page 270 of the textbook.

Compare your responses with the suggested answers in the Appendix, Activity 7, pages 107–108.

LOOKING BACK

In this activity you used spreadsheets and your graphing calculator to explore two types of annuities: making payments towards a loan and making payments towards a savings account or savings plan (e.g., RRSPs and Canada Savings Bonds).



5. Turn to page 270 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 7, page 108.

ACTIVITY 8

Preparing a Budget

These days, politicians often compare preparing a **budget** for a government to preparing a budget for a household. They argue that a government's income and expenses should balance, just like the income and expenses of the average person. They also argue that if money must be borrowed, there should be provisions within the budget to repay the loan in a timely fashion, again, as the average person ensures.

However, many people do not prepare household budgets, leaving income and expenses to chance. This lack of preparedness can lead to financial difficulties, especially during an emergency, such as the loss of a job or illness in the family.

Budgets can help you focus on how you spend your money. This knowledge can help you alter spending habits, so you can meet your present needs and also plan and save for emergencies, future purchases, holidays, and retirement.

Budgets are important for young people, too, especially for those moving out on their own who have a limited income and have to meet expenses, like rent and utilities, food and clothing, tuition, transportation, health, entertainment, and recreation. This is a period in life when credit is readily available and financial missteps can occur.

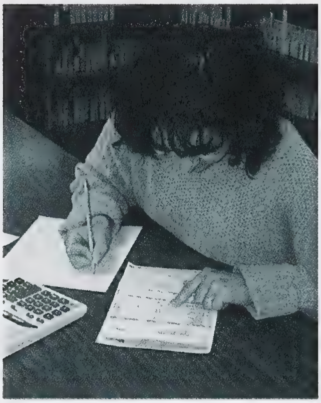
In this activity you will gain expertise in preparing and analysing budgets. You will need these skills to complete the module project.

Turn to page 271 of the textbook and read the introductory paragraphs of Tutorial 5.8, "Preparing a Budget."

1. What is a budget? What is a balanced budget?

Compare your response with the suggested answer in the Appendix, Activity 8, page 108.

On page 271 of the textbook you were given some suggested guidelines for developing or revising a budget. Remember, these are guidelines only. A budget's specifics will widely vary among individuals with different personal circumstances.



For example, Rana keeps a monthly budget of all her income and expenses. Rana was given notice that her rent will increase by $50 per month. In addition, her utilities and cable TV will increase $18 per month altogether. However, Rana did receive some good news. Her car insurance will decrease by $22 per month—she has driven accident-free for the past three years—and she will receive a $200-per-month increase in her salary. To accommodate all these changes, Rana needs to alter her budget to keep it balanced.

Altering a budget and maintaining the balance requires adjusting a number of items to accommodate a new expense, like purchasing a car. Turn to pages 272 to 274 of the textbook and work through "Example 1: Determine the Amount Available to Spend on Housing" and " Example 2: Analyze a Budget."

2. Answer the following exercises on pages 274 to 276 of the textbook.

- **a.** exercises 1 and 2 of "Discussing the Ideas"
- **b.** exercises 1, 2, 3, and 5 of "Exercises: Checking Your Skills"

Compare your responses with the suggested answers in the Appendix, Activity 8, pages 108–111.

Now that you have a better understanding of budgeting, view the segment titled *Budgeting* on the Applied Mathematics 20 CD.

LOOKING BACK

In this activity you defined the terms *budget* and *balanced budget*, analysed a number of different budgets, and identified the key elements of a budget. You then created budgets for individuals to accommodate personal circumstances; and you revised some budgets, determining which expenditures can be adjusted and which cannot.

3. Turn to page 277 of the textbook and answer "Communicating the Ideas."

Compare your response with the suggested answer in the Appendix, Activity 8, page 112.

Follow-up Activities

This module dealt with Chapter 5: Finance in the *Addison-Wesley Applied Mathematics 11 Source Book.*

Turn to page 280 of the textbook and review the skills and concepts that were developed in this module. Also, read the important results and formulas you discovered.

1. Answer exercise 1 of Part A of "What Should I Be Able to Do?" on page 281 of the textbook. **Note:** The last sentence of Paragraph II should read, "Assume the deposits are made at the beginning of the year."
2. Answer exercises 3, 4, 6, 7.a., 8, 9, 10, and 11 of Part B of "What Should I Be Able to Do?" on pages 282 and 283 of the textbook.

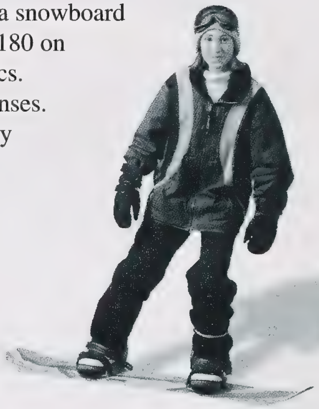
Compare your responses with the suggested answers in the Appendix, Follow-up Activities, pages 112–117.

If you had difficulties understanding the skills and concepts in Module 5: Finance, it is recommended that you do the Extra Help. If you have a clear understanding of the skills and concepts in this module, it is recommended that you do the Enrichment. You may decide to do both.

EXTRA HELP

A common feature of many budget discussions is a set of circle graphs showing how income and expenses are divided up. In the following example, you will review how circle graphs are constructed.

Example



Joe-Anne lives at home and has a part-time job as a snowboard instructor. Last month, she spent a total of $300: $180 on clothes, $90 on entertainment, and $30 on cosmetics. Construct a circle graph showing Joe-Anne's expenses. Show the percent of the total each expense category represents.

Solution

First, determine what percent of Joe-Anne's total expenses each category is.

$$\begin{aligned}\text{Clothes} &= \frac{180}{300}\\ &= 0.60\\ &= 60\%\end{aligned}$$

$$\begin{aligned}\text{Entertainment} &= \frac{90}{300}\\ &= 0.30\\ &= 30\%\end{aligned}$$

$$\begin{aligned}\text{Cosmetics} &= \frac{30}{300}\\ &= 0.10\\ &= 10\%\end{aligned}$$

Next, determine how many degrees the central angle of each sector should be. Remember, there are 360° in a circle.

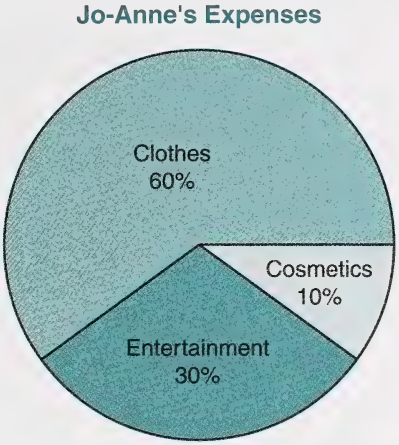
$$\begin{aligned}\text{Clothes} &= 60\% \text{ of } 360\\ &= 0.60 \times 360^\circ\\ &= 216^\circ\end{aligned}$$

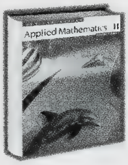
$$\begin{aligned}\text{Entertainment} &= 30\% \text{ of } 360\\ &= 0.40 \times 360^\circ\\ &= 108^\circ\end{aligned}$$

$$\begin{aligned}\text{Cosmetics} &= 10\% \text{ of } 360\\ &= 0.10 \times 360^\circ\\ &= 36^\circ\end{aligned}$$

You can check your calculations by finding the sum of the central angles. They should add up to 360°.

The circle graph looks like the following.





1. Turn to page 274 of the textbook and answer exercise 1 of "Practise Your Prior Skills."

2. Why do you think circle graphs are used in budget discussions?

Compare your responses with the suggested answers in the Appendix, Follow-up Activities, Extra Help, page 118.

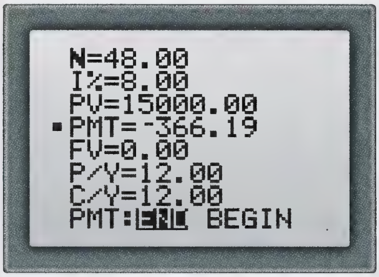
ENRICHMENT

In the activities of this module, you used the TVM Solver on your graphing calculator to analyse compound interest problems. In most problems, you entered information directly into the TVM Solver, using the following sign convention:

- Money you receive, such as the compound amount of an investment, is positive.
- Money you pay out, like loan payments and deposits into a savings account, is negative.

Example

Create a scenario for which the following entries in the TVM solver is a solution.



```
 N=48.00
 I%=8.00
 PV=15000.00
▪PMT=-366.19
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

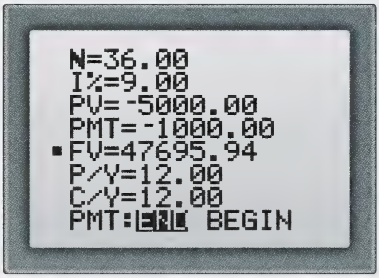
Solution

Because PV is positive, this is money received. Because PMT is negative, these are payments rather than deposits. The following is one possible scenario:

> Marvin borrowed $15 000 from the local credit union to construct a garage for his new car. He agreed to pay off the loan over 4 years by making monthly payments of $366.19. The credit union is charging Marvin 8% annual interest, compounded monthly.

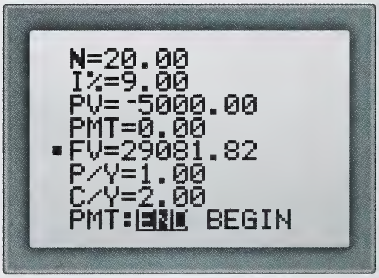
For each display given, create a possible scenario.

1.



```
 N=36.00
 I%=9.00
 PV=-5000.00
 PMT=-1000.00
▪FV=47695.94
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

2.



```
 N=20.00
 I%=9.00
 PV=-5000.00
 PMT=0.00
▪FV=29081.82
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

Compare your responses with the suggested answers in the Appendix, Follow-up Activities, Enrichment, page 118.

MODULE PROJECT
BUDGETING FOR LIVING INDEPENDENTLY

Completing the Project

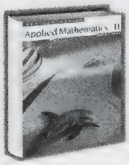
At the beginning of this module you previewed the requirements for your module project. By now, you should have completed the initial research for your project, Budgeting for Living Independently. Remember, one of the major items in your budget will be the costs associated with buying or leasing a car. You should have collected all the information you need to make your decision as to which option would be appropriate for you. You are now ready to complete the final phases of your project.

Turn to pages 242 and 243 of the textbook and read “The Cost of Running a Car.”

1. Complete exercises 1 to 8 of “The Cost of Running a Car.” Your answers will be based on the vehicle you would purchase when you are on your own. Keep a copy of your responses to these exercises in the project section of your mathematics binder. You will use these responses to help you complete the questions in the Project Booklet.

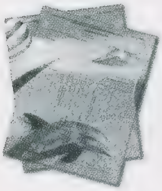
Compare your responses with the suggested answers in the Appendix, Module Project, pages 119–120.

Of course, the cost of running a car is only one of the expenses you may have when you are living independently. Your challenge is to prepare a budget that balances income and expenditures. This budget must accurately reflect the real costs you will encounter. Before you prepare this budget, you will critique a budget that another student has prepared.



2. Turn to pages 284 and 285 of the textbook and answer the questions posed in Part C of "What Should I Be Able to Do?" **Note:** Keep a copy of your responses in the project section of your mathematics binder.

Compare your responses with the suggested answers in the Appendix, Module Project, pages 120–121.



The Module Project

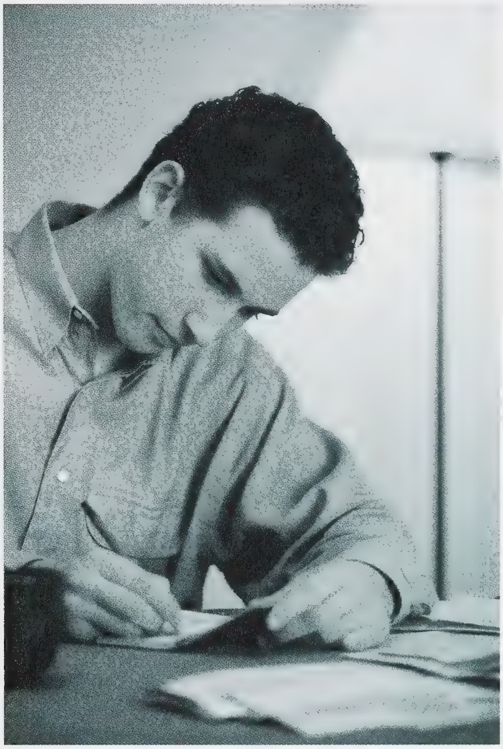
Now that you have more insight into the module project, revise your answers. Then complete the Module 5 project, Budgeting for Living Independently.

You may use your responses from the textbook exercises on pages 220, 242 and 243, and 284 and 285 to help complete your project. These responses should be in the project section of your mathematics binder.

Submit your completed Module 5 Project Booklet to your teacher.

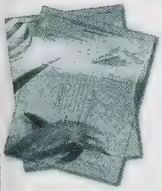
Module Summary

In this module you explored issues in financial mathematics. You began by focusing on earning an income and banking. You examined wages and salaries earned in a variety of employment situations. You then distinguished between gross income and net income, and you investigated opportunities for investing your income and banking options. You explored chequing accounts, financial statements, and earning interest on your deposits.



You also explored the financial considerations associated with living independently—such as the cost of borrowing money; the cost of running a car; shopping wisely; the costs of housing, taxes, and utilities; exchange rates; and budgeting skills.

Budgeting your money involves a careful balance between income and expenses. When you succeed at this task, you feel the pride of accomplishment and the satisfaction of being able to reward yourself for your efforts. What do you plan to do with the money you save? Purchase a vehicle? How will you decide what you can afford today and what you must postpone until tomorrow?



Module Assignment

To demonstrate what you have learned in this module, complete the module assignment in the Assignment Booklet.

Submit your completed Module 5 Assignment Booklet to your teacher.

APPENDIX

Glossary
Suggested Answers
Image Credits

GLOSSARY

annuity: a payment received or made at regular periods

basic deductions: deductions from gross pay set by the federal government, including income tax, Canada Pension Plan (CPP), and Employment Insurance (EI)

budget: a plan for the spending of money

commission: payment based on value of sales

compound interest: interest added to principal at the end of each interest period

effective annual rate of interest: the annual rate of interest that produces the same interest as a nominal rate compounded more frequently than once a year

equivalent rates of interest: two interest rates with different compounding periods that yield the same interest

exchange rate: the rate used to convert one currency to another

gross pay (income): total pay before deductions

mill rate: the rate expressed as a thousandth of a dollar used to determine property taxes from the property's assessed value

net income: total pay after deductions

nominal rate of interest: the stated rate of interest of a loan or deposit

pay period: the length of time between payments for work performed

piecework: earnings based on the number of items produced

reconcile: to confirm the accuracy of records and statements by comparison

salary: a fixed payment per payment period

simple interest: interest on money borrowed or money lent, calculated by multiplying the principal by the annual interest rate and by the time (in years)

$$I = Prt$$

tax credit: a deduction from income tax payable

taxable income: income after tax-exempt deductions have been subtracted

unit pricing: determination of the price per unit of the item purchased

wage: payment based on hours worked

Activity 1: Earning a Living

1. Textbook exercises 1 to 3 of "Practice Your Prior Skills," p. 222

1. a. $$\begin{aligned}12\% &= \frac{12}{100}\\ &= 0.12\end{aligned}$$

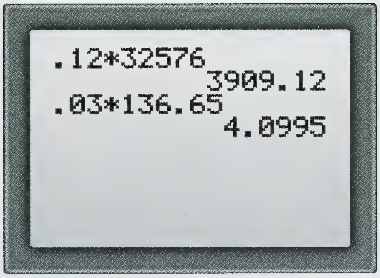
b. $$\begin{aligned}7\% &= \frac{7}{100}\\ &= 0.07\end{aligned}$$

c. $$\begin{aligned}150\% &= \frac{150}{100}\\ &= 1.50\end{aligned}$$

d. $$\begin{aligned}6\% &= \frac{6}{100}\\ &= 0.06\end{aligned}$$

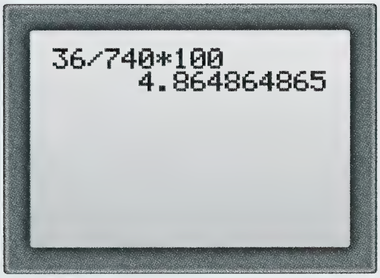
2. a. $$\begin{aligned}12\% \text{ of } \$32\,576 &= 0.12\times\$32\,576\\ &= \$3909.12\end{aligned}$$

b. $$\begin{aligned}3\% \text{ of } \$136.65 &= 0.03\times\$136.65\\ &= \$4.10\end{aligned}$$



```
.12*32576
             3909.12
.03*136.65
              4.0995
```

3. $$\begin{aligned}\frac{36}{740} &= \frac{x}{100}\\ \frac{36}{740}\times100 &= \frac{x}{100}\times100\\ \frac{36}{740}\times100 &= x\\ x &= \frac{36}{740}\times100\\ x &\doteq 5\end{aligned}$$



```
36/740*100
         4.864864865
```

Therefore, \$36 is approximately 5% of \$740.

2. Textbook exercises 1 to 5 of "Investigation 1: Interpreting a Wage Graph," p. 222

1. The slope of the graph changes at point $(40, 240)$.

2. The slope of the graph changes at this point because the employee receives overtime pay after working 40 hours.

3. Use the formula $\text{slope} = \frac{\text{rise}}{\text{run}}$. Between points $(0, 0)$ and $(40, 240)$,

$$\begin{aligned}\text{slope} &= \frac{\text{rise}}{\text{run}}\\ &= \frac{240-0}{40-0}\\ &= \frac{240}{40}\\ &= 6\end{aligned}$$

Between points $(40, 240)$ and $(60, 420)$,

$$\begin{aligned}\text{slope} &= \frac{\text{rise}}{\text{run}}\\ &= \frac{420-240}{60-40}\\ &= \frac{180}{20}\\ &= 9\end{aligned}$$

4. The first slope, 6, is the regular hourly rate of pay. The employee earns $6/h for the first 40 h.

   The second slope, 9, is the overtime hourly rate. The employee earns $9/h for any overtime hours.

5. Gross income = Regular pay + Overtime pay

   The employee works 40 regular hours and 30 hours overtime.

$$\begin{aligned}\therefore \text{ Gross income} &= 40\text{ h} \times \$6/\text{h} + 30\text{ h} \times \$9/\text{h}\\ &= \$240 + \$270\\ &= \$510\end{aligned}$$

   The employee's gross income is $510.

3. a. **Textbook exercises 1 to 4 of "Discussing the Ideas," p. 225**

   1. A salary is a fixed amount of money earned over a specified time period, such as a month or a year. A wage is money earned hourly or daily.

   2. Answers will vary. Sample answers are given.

      a. Examples of jobs where employees get paid a wage are jobs in fast-food restaurants, service stations, warehouses, and maintenance firms.

b. Many employees in sales get paid a commission. Furniture, appliance, vehicle, and computer salespeople are examples of people that fall in this category.

c. Teachers, civil servants, nurses, and the clergy are a few examples of employees that receive a salary.

3. Answers will vary. A sample answer is given.

Salaries ensure employees a steady and uniform income. Disadvantages of salaries include lack of financial incentives for performing better than co-workers and, usually, no reward for overtime.

Piecework rewards faster workers who can produce more items than their peers. However, piecework encourages an employee to hurry production and sacrifice quality. Another disadvantage is the undue stress placed on an employee who may have to work long hours to produce sufficient items to make a living.

Straight commission encourages salespeople to be sensitive to customer expectations and, as a result, be service-oriented. However, during periods of slow sales, salespeople may not earn a sufficient income to make a decent living.

Graduated commission encourages salespeople to be aggressive in sales, put in extra effort to close a deal, and work longer hours. Disadvantages include lower income during periods of slow sales and undue competition among colleagues for clients.

4. Answers will vary. A sample answer is given.

A company might structure its commission payment as a graduated commission to reward productive workers who put in extra effort on the job. Increased sales will result in extra profit for the company.

b. Textbook exercises 1 to 6, 8, and 10 of "Exercises: Checking Your Skills," pp. 226 and 227

1. Some of the advantages to an employer paying her salespeople a commission instead of a salary include increased sales and customer satisfaction. It also reduces fixed costs. When sales are slow, this can be very important. Advantages to her salespeople include high income for better performance and a feeling of satisfaction for doing an exceptional job.

2. Biweekly pay periods are payments made every 2 weeks. Because there are 52 weeks in a year, employees would receive $52 \div 2 = 26$ payments a year.

Because semi-monthly pay periods are made 2 times a month, there are $12 \times 2 = 24$ payments per year.

3. In 52 weeks there are $52 \times 7 = 364$ days. In a year (except for a leap year) there are 365 days. Therefore, if the first payday of the year is January 1, there will be $1 + 52 = 53$ paydays.

It is not possible for there to be fewer than 52 paydays.

Activity 1 (continued)

4. One way to estimate her gross earnings is to first estimate 50% of her sales. Since 50% of \$26 000 is \$13 000 and since 5% is $50\% \div 10$, Geri's commissions will be approximately $\$13\,000 \div 10 = \$1300$. Therefore, her approximate gross earnings will be $\$900 + \$1300 = \$2200$.

5. If Caroline were paid \$2.50 for each of the 4 arrangements she could make every hour, she would only earn $4 \times \$2.50 = \$10/\text{h}$. Caroline should accept the \$12/h payment scheme because she will earn more.

6. **a.** Gross earnings = Regular wages + Tips

$$\begin{aligned} &= 27 \times \$7.50 + \$134.00 \\ &= \$202.50 + \$134.00 \\ &= \$336.50 \end{aligned}$$

Joe receives \$336.50 in wages and tips a week.

b. Gross earnings = Regular wages + Overtime

$$\begin{aligned} &= 40 \times \$11.50 + 6 \times (2 \times \$11.50) \\ &= \$460.00 + \$138.00 \\ &= \$598.00 \end{aligned}$$

Sze Mun received \$598.00 in regular wages and overtime pay last week.

c. Gross earnings = Commission

$$\begin{aligned} &= 12\% \text{ of } \$5675.00 \\ &= 0.12 \times \$5675.00 \\ &= \$681.00 \end{aligned}$$

Jack received \$681.00 in straight commission last week.

d. Gross earnings = \$0.25 per tree

$$\begin{aligned} &= \$0.25 \times 4350 \\ &= \$1087.50 \end{aligned}$$

Megan earned \$1087.50 through piecework that week.

e.
$$\begin{aligned}\text{Gross earnings} &= 3\% \text{ of first } \$15\,000 \text{ in sales} + 5\% \text{ of sales over } \$15\,000\\ &= 0.03\times\$15\,000.00+0.05\times(\$32\,150.00-\$15\,000.00)\\ &= 0.03\times\$15\,000.00+0.05\times\$17\,150.00\\ &= \$450.00+\$857.50\\ &= \$1307.50\end{aligned}$$

Marlene earned $1307.50 in graduated commissions last week.

f.
$$\begin{aligned}\text{Gross earnings} &= \text{Base salary} + \text{Commission}\\ &= \$200.00+4\% \text{ of } \$4780.00\\ &= \$200.00+0.04\times\$4780.00\\ &= \$200.00+\$191.20\\ &= \$391.20\end{aligned}$$

Duncan earned $391.20 in salary and commissions last week.

g.
$$\begin{aligned}\text{Gross earnings} &= \text{Base salary} + \text{Commission on sales over } \$25\,000\\ &= \$1800.00+0.08\times(\$36\,740.00-\$25\,000.00)\\ &= \$1800.00+0.08\times\$11\,740.00\\ &= \$1800.00+\$939.20\\ &= \$2739.20\end{aligned}$$

Frank received $2739.20 in salary and commission last month.

8.
$$\begin{aligned}\text{Gross pay} &= \text{wages} + \text{tips}\\ &= 34\times\$6.25+70\% \text{ of } \$254.00\\ &= 34\times\$6.25+0.70\times\$254.00\\ &= \$212.50+\$177.80\\ &= \$390.30\end{aligned}$$

May's gross pay was $390.30 last week.

10. a. Determine the equation for each pay scheme.

Let x be the total monthly sales and y be the gross monthly earnings.

Option 1: Base salary + Commission

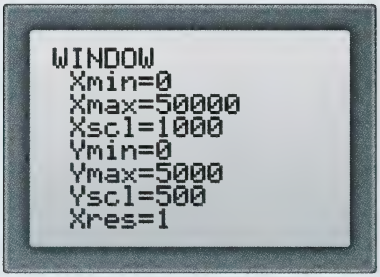
$$\begin{aligned}\text{Gross earnings} &= \text{Base salary} + \text{Commission}\\ y &= 900+0.06x\end{aligned}$$

Option 2: Commission only

$$\begin{aligned}\text{Gross earnings} &= \text{Commission}\\ y &= 0.09x\end{aligned}$$

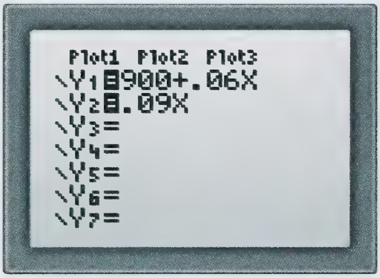
Activity 1 (continued)

Use your graphing calculator to graph these equations. Use the following window settings.

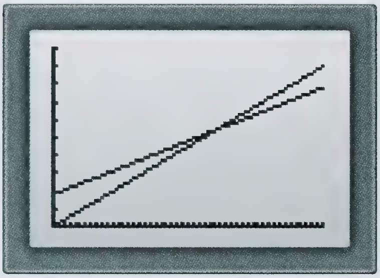


```
WINDOW
 Xmin=0
 Xmax=50000
 Xscl=1000
 Ymin=0
 Ymax=5000
 Yscl=500
 Xres=1
```

Enter the equations for each option into the equation editor and graph the equations.

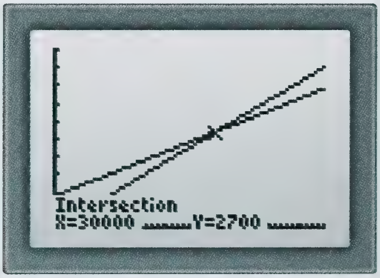


```
  Plot1  Plot2  Plot3
\Y1=900+.06X
\Y2=.09X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```



b. Determine where the two graphs intersect.

2nd [CALC] 5 (5:intersect) ENTER
ENTER ENTER



```
Intersection
X=30000      Y=2700
```

Both options will pay Jay \$2700 a month for \$30 000 in sales. If Jay sells less than \$30 000 worth of computers, the first option $(\$900 + 6\%\ \text{commission})$ will pay him more. If he sells more than \$30 000 worth of computers, the second option (9% commission) will pay him more.

c. If Jay knows the average sales per salesperson, he could easily decide which option is better.

4. **Textbook exercise "Communicating the Ideas," p. 227**

Answers will vary. A sample letter is given.

Dear Aunt May,

I understand you are opening a computer store and are uncertain whether to pay your staff a fixed hourly rate or a commission. I recommend paying your staff a commission. By paying your staff commission, they will work harder to sell your product, try to meet the needs of your customers, and try to encourage customers to return to your store for repeat business. Increased sales also means more income for themselves. In turn, there will be higher profits for your company due to increased sales. In addition, your costs will decline if a sales slump should occur.

Activity 2: Payroll Deductions

1. **a.** Neil's basic deductions are

CPP	$35.26
EI	$19.96
Income tax	$187.60
Total	$242.82

b. Determine what percent $242.82 is of $887.25.

$$\begin{aligned} \frac{242.82}{887.25} &= \frac{x}{100} \\ \frac{242.82}{887.25} \times 100 &= \frac{x}{100} \times 100 \\ x &= \frac{242.82}{887.25} \times 100 \\ &\doteq 27.4 \end{aligned}$$

Neil's basic deductions are approximately 27.4% of his gross income.

2. Other personal deductions that may appear are union dues, government health-care insurance, and company pension plan premiums.

3. Net pay is determined by subtracting all basic and personal deductions from the employee's gross earnings.

$$\text{Net pay} = \text{Gross pay} - \left(\text{Basic deductions} + \text{Personal deductions}\right)$$

Activity 2 (continued)

4. a. Textbook exercises 1 and 2 of "Discussing the Ideas," p. 233

1. Gross earnings is the amount of money earned before deductions. Net earnings is the amount of money remaining after deductions. Taxable earnings is the part of gross earnings on which income tax is paid.

2. If you were hired for a job today, income tax, Canada Pension Plan (CPP) contributions, and Employment Insurance (EI) premiums would be deducted from your pay.

b. Textbook exercises 1 to 8 of "Exercises: Checking Your Skills," pp. 233 and 234

1. Louis's employer will contribute the same amount Louis does to CPP. Last month they each contributed $35.00.

   Louis's employer will pay 1.4 times as much as Louis pays for Employment Insurance.

$$\begin{aligned}\text{Employer's contribution} &= 1.4 \times \$28.94 \\ &= \$40.52\end{aligned}$$

2. A TD1 form is a Tax Deduction 1 form. Your employer uses the information you provide on this form to determine how much income tax to deduct from your paycheque each pay peiod.

3. Because provincial and territorial tax rates differ, the payroll deduction tables differ from province to province and from territory to territory.

4. **a.** In 1999, CPP deductions increase as income increases until a maximum yearly deduction of $1186.50 is reached.

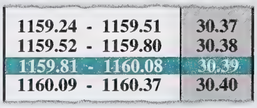
   b. Income tax increases as income increases. There is no maximum.

   c. In 1999, EI premiums increase as income increases until a maximum yearly deduction of $994.50 is reached.

   d. As the TD1 claim code increases, the income tax deducted decreases.

5. **a.** Use the monthly CPP Contribution tables on page 287 of the textbook.

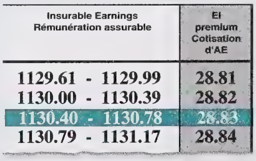
   $\therefore$ CPP = $30.39



1159.24 - 1159.51	30.37
1159.52 - 1159.80	30.38
1159.81 - 1160.08	30.39
1160.09 - 1160.37	30.40

   b. Use the EI tables on page 288 of the textbook.

   $\therefore$ EI = $28.83



Insurable Earnings Rémunération assurable	EI premium Cotisation d'AE
1129.61 - 1129.99	28.81
1130.00 - 1130.39	28.82
1130.40 - 1130.78	28.83
1130.79 - 1131.17	28.84

c. CPP = $28.90

d. Use the biweekly Saskatchewan Federal and Provincial tax tables on page 289 of the textbook.

$\therefore$ Income tax = $243.80

e. Income tax = $285.85

f. EI = $29.72

6. Contributing to an RRSP or RPP does not affect CPP and EI contributions because they are based on gross income. Contributing to an RRSP or RPP does, however, reduce your taxable income and, therefore, your income tax deductions.

7. a. Jackie's CPP deductions will be higher than Keith's because Jackie's gross income is higher.

b. Again, because Jackie's income is higher than Keith's income, Jackie's EI deductions will be higher.

c. Because Jackie's income is higher, she will pay more in income tax than Keith, even though their claim codes are the same.

d. It seems fair that the person with a higher income will pay more tax and contribute more to EI and CPP.

8. a. Determine Sandra's basic deductions from the tables.

For biweekly earnings of $1184.00, Sandra's CPP contributions are $36.73 and her EI premiums are $30.19.

To determine her income tax deduction, calculate her taxable income.

$$\begin{aligned}\text{Taxable income} &= \text{Gross income} - \text{RRSP}\\ &= \$1184.00 - \$50.00\\ &= \$1134.00\end{aligned}$$

Using claim code 3, Sandra's income tax per pay period is $208.15.

$$\begin{aligned}\therefore \text{ Sandra's net income} &= \text{Gross income} - \text{Deductions}\\ &= \$1184.00 - (\$36.73 + \$30.19 + \$208.15 + \$50.00 + \$10.00)\\ &= \$1184.00 - \$335.07\\ &= \$848.93\end{aligned}$$

b. If Sandra's claim code changes from 3 to 8, her income tax would be reduced from \$208.15 to \$129.20, reducing it by $\$208.15 - \$129.20 = \$78.95$.

Therefore, her net income would increase by the same amount.

$$\begin{aligned} \therefore \text{ Sandra's net income} &= \$848.93 + \$78.95 \\ &= \$927.88 \end{aligned}$$

5. Textbook exercises 10 and 11 of "Exercises: Checking Your Skills," p. 234

10. a. EI and CPP deductions are each approximately 3% of \$1320.

$$0.03 \times \$1320 = \$39.60$$

To determine which percent to use to calculate income tax, find Alina's taxable income.

$$\begin{aligned} \text{Taxable weekly income} &= \text{Gross weekly income} - \text{RRSP} \\ &= \$1320 - \$100 \\ &= \$1220 \end{aligned}$$

$$\begin{aligned} \text{Annual taxable income} &= \text{Taxable weekly income} \times 52 \\ &= \$63\ 440 \end{aligned}$$

Alina's taxable income is more than \$60 000. So, Alina's income tax deduction will be approximately 39% of her taxable weekly income.

$$\begin{aligned} \text{Income tax} &= 0.39 \times \$1220 \\ &= \$475.80 \end{aligned}$$

$$\begin{aligned} \text{Net earnings} &= \text{Gross earnings} - \text{Total deductions} \\ &= \$1320.00 - (\$39.60 + \$39.60 + \$475.80 + \$100 + \$10) \\ &= \$1320.00 - \$665.00 \\ &= \$655.00 \end{aligned}$$

b. This estimate of net earnings may be lower than her actual net earnings because her taxable income is close to \$60 000, the bottom end of the top range.

c. Yes, increasing Alina's RRSP contribution will reduce the amount of her taxable income and the income tax deducted each week. She will also increase her savings for her retirement years.

11. a. EI and CPP deductions are each approximately 3% of $2325.

$$0.03 \times \$2325 = \$69.75$$

To determine which percent to use to calculate income tax, find Jim's taxable income.

$$\begin{aligned} \text{Taxable semi-monthly income} &= \text{Gross semi-monthly income} - \text{RPP} \\ &= \$2325 - \$150 \\ &= \$2175 \end{aligned}$$

$$\begin{aligned} \text{Total taxable income} &= \text{Taxable semi-monthly income} \times 24 \\ &= \$2175 \times 24 \\ &= \$52\ 200 \end{aligned}$$

Jim's taxable income is between $30 000 and $60 000. So, use 29% to estimate Jim's semi-monthly income tax.

$$\begin{aligned} \text{Income tax} &= 0.29 \times \$2175 \\ &= \$630.75 \end{aligned}$$

$$\begin{aligned} \text{Medical insurance premium} &= 1.5\% \text{ of } \$2325 \\ &= 0.015 \times \$2325 \\ &= \$34.88 \end{aligned}$$

$$\begin{aligned} \text{Total deductions} &= \$69.75 + \$69.75 + \$630.75 + \$34.88 + \$150.00 \\ &= \$955.13 \end{aligned}$$

$$\begin{aligned} \therefore \text{ Net earnings} &= \text{Gross earnings} - \text{Total deductions} \\ &= \$2325.00 - \$955.13 \\ &= \$1369.87 \end{aligned}$$

b. Jim's net earnings may be lower than the estimate because his taxable income is close to the top of the $30 000 to $60 000 range, thus making the estimate of the income tax deducted per pay period low.

Activity 2 (continued)

6. Answers will vary. A sample answer is given.

Provincial Services	Federal Services
• highways	• postal service
• health care	• national parks
• education	• post-secondary education
• provincial parks	• health-care standards
• labour standards	• currency and banking standards
• law enforcement	• ocean fishery
	• interprovincial and international trade
	• law enforcement
	• national defence

Activity 3: Expenses

1. a. Textbook exercise 4 of "Discussing the Ideas," p. 238

4. To find the exchange rate for a person travelling from the United States to Canada, simply divide 1 by 0.65, obtained from $\text{US } \$0.65 = \text{Can } \$1.00$.

$$\begin{aligned} \text{US } \$0.65 &= \text{Can } \$1.00 \\ \frac{\text{US } \$0.65}{0.65} &= \frac{\text{Can } \$1.00}{0.65} \\ \text{US } \$1.00 &= \frac{\text{Can } \$1.00}{0.65} \\ \text{US } \$1.00 &\doteq \text{Can } \$1.54 \end{aligned}$$

b. Textbook exercises 8, 9, and 11 of "Exercises: Checking Your Skills," p. 241

8. The cost of lift tickets, accommodation, and food is $\text{US } \$125 + \text{US } \$120 = \text{US } \$245$. Convert this amount to Canadian dollars.

$$\begin{aligned} \text{US } \$1.00 &= \text{Can } \$1.40 \\ 245 \times \text{US } \$1.00 &= 245 \times \text{Can } \$1.40 \\ \text{US } \$245.00 &= \text{Can } \$343.00 \end{aligned}$$

They also need Can $500 for travel and incidentals.

The total they must save over 6 months is $\$500.00 + \$343.00 = \$843.00$.

Therefore, each month, they should set aside $\frac{\text{Can } \$843.00}{6} = \text{Can } \$140.50$.

9. If the Canadian dollar increases relative to the American dollar, the Canadian traveller to the United States benefits. The traveller will receive more American dollars to spend for the same number of Canadian dollars.

11.
$$\begin{aligned}1 \text{ Dutch Guilder} &= \text{Can } \$0.71\\ 200 \text{ Dutch Guilders} &= 200\times\text{Can } \$0.71\\ &= \text{Can } \$142.00\end{aligned}$$

$$\begin{aligned}\text{Can } \$2.24 &= £1.00\\ \frac{\text{Can } \$2.24}{2.24} &= \frac{£1.00}{2.24}\\ \text{Can } \$1.00 &= \frac{£1.00}{2.24}\\ 142\times\text{Can } \$1.00 &= 142\times\frac{£1.00}{2.24}\\ \text{Can } \$142.00 &= £63.39\end{aligned}$$

She should receive 63.39 British pounds.

2. Textbook exercises 1.a., 1.c., and 2 of "Exercises: Checking Your Skills," p. 239

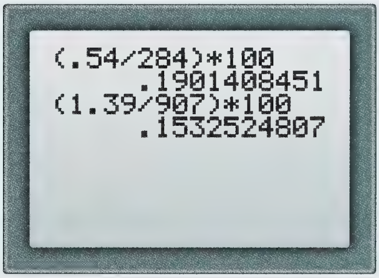
1. a. Compare the cost of 100 mL of tomato soup.

Offer 1: 284 mL for \$0.54

$$100 \text{ mL for } \frac{\$0.54}{2.84} \text{ or } \$0.19$$

Offer 2: 907 mL for \$1.39

$$100 \text{ mL for } \frac{\$1.39}{9.07} \text{ or } \$0.15$$



```
(.54/284)*100
          .1901408451
(1.39/907)*100
          .1532524807
```

Therefore, \$1.39 for 907 mL is the better buy.

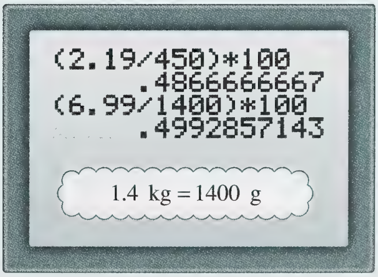
c. Compare the cost of 100 g of cereal.

Offer 1: 450 g for \$2.19

$$100 \text{ g for } \frac{\$2.19}{4.50} \text{ or } \$0.49$$

Offer 2: 1.4 kg for \$6.99

$$100 \text{ g for } \frac{\$6.99}{14} \text{ or } \$0.50$$



```
(2.19/450)*100
          .4866666667
(6.99/1400)*100
          .4992857143
```

1.4 kg = 1400 g

Therefore, \$2.19 for 450 g is the better buy.

Activity 3 (continued)

2. **a.** Compare the cost of 1 videocassette.

Offer 1: 12 cassettes for $49.99

$$1 \text{ cassette for } \frac{\$49.99}{12} \text{ or } \$4.17$$

Offer 2: 3 cassettes for $13.99

$$1 \text{ cassette for } \frac{\$13.99}{3} \text{ or } \$4.66$$

Therefore, a box of 12 videocassettes for $49.99 is the better buy.

b. It is not always wise to purchase the package with the lowest unit cost. If the package is too large, where not all of the product can be used before its quality deteriorates, some of the product will be wasted. For example, if you do not drink a lot of milk, you may end up throwing a large portion of a 4-L carton out because it spoils. Even though it may have the lower unit cost, it may not be the best buy.

3. **Textbook exercises 5 and 6 of "Exercises: Checking Your Skills," p. 240**

5. **a.**

$$\begin{aligned}\text{Property tax} &= \frac{\text{Assessed value} \times \text{Mill rate}}{1000}\\ &= \frac{\$73\,900 \times 31.8}{1000}\\ &= \$2350.02\end{aligned}$$

Miki's property tax for last year was $2350.02.

b. If the mill rate increases 3 mills to 34.8 mills,

$$\begin{aligned}\text{Property tax} &= \frac{\text{Assessed value} \times \text{Mill rate}}{1000}\\ &= \frac{\$73\,900 \times 34.8}{1000}\\ &= \$2571.72\end{aligned}$$

Therefore, the increase in Miki's property tax is $\$2571.72 - \$2350.02$ or $221.70.

c. Miki should put aside $\frac{\$2571.72}{12} = \$214.31$ a month for the increased property taxes.

d. One advantage of paying property taxes with mortgage payments is not having to pay the entire amount of the taxes when they are due. You do not have to budget separately for taxes.

6. $$\text{Assessed value} = 0.70 \times \$225\ 000$$
$$= \$157\ 500$$

$$\therefore\ \text{Property tax} = \frac{\text{Assessed value} \times \text{Mill rate}}{1000}$$
$$= \frac{\$157\ 500 \times 14.3}{1000}$$
$$= \$2252.25$$

The farmer should budget $\frac{\$2252.25}{12} = \$187.69$ a month for taxes.

4. Textbook exercise "Communicating the Ideas," p. 241

Municipal governments and school boards raise most of their revenues through property taxes. Property owners pay an amount each year based on the assessed value of their property. The tax rate is expressed in mills, or thousandths of a dollar. To determine how much tax a homeowner will pay, you must know the assessed value of the property and the mill rate; then you can apply the following formula:

$$\text{Property tax} = \frac{\text{Assessed value} \times \text{Mill rate}}{1000}$$

Activity 4: Keeping Track of Money

1. Textbook exercises 1 to 4 of "Investigation 1: Reconciling a Bank Statement," p. 245

1. and 2. Check off each item in Chris's transaction record that appears on the bank's printed statement. Then include entries on the bank statement that did not appear on Chris's record. Update the balance after each entry.

Date	No.	Description	Debit	Credit	√	Balance
		Balance forward			√	523.14
Sep. 17		Withdrawal	50.00		√	473.14
Sep. 18	34	The Electronic Store	62.18		√	410.96
Sep. 29		Deposit		341.60	√	751.56
Oct. 3	35	Clothing Express	137.46		√	614.10
Oct. 4		Withdrawal	40.00		√	574.10
Oct. 12		Withdrawal	40.00		√	534.10
Oct. 15	36	Bike and Skate	83.12			450.98
Oct. 1		Maintenance fee	9.75		√	441.23
Oct. 5		Error in entry of Oct. 3	0.18		√	441.05
Oct. 10		Withdrawal	60.00		√	381.05

3.

Final Balance on Statement:	465.17
Uncleared Cheque:	− 83.12
Balance:	$382.05

Activity 4 (continued)

4. The result from Step 3 is $1.00 more than the balance in Chris's records. Since the October 3 entry error was corrected, there must be a mathematical error as well.

   If you check the balance after the deposit on September 29, you will notice an addition error.

   $$\$410.96 + \$341.60 = \$752.56$$

   Adjust each subsequent balance by adding a dollar.

   The new final balance should be $382.05, which matches the result from Step 3. Now, Chris's bank statement and his transaction records are reconciled.

2. a. **Textbook exercises 1 and 2 of "Discussing the Ideas," p. 247**

   1. It is important to keep your personal bank register updated to avoid writing a cheque without sufficient funds, to plan your expenditures based on an accurate bank balance, and to resolve any bank errors that affect your account.

   2. You should include direct debit transactions so you can keep track of your bank balance and can check for errors made by banks or businesses.

   b. **Textbook exercises 1 and 2 of "Exercises: Checking Your Skills," pp. 247 and 248**

   1.

Account Description	Debits	Credits	Date	Balance
Balance forward			11/8	1195.12
Cheque 200	789.36		12/8	405.76
Cheque 201	316.26		15/8	89.50
Deposit		704.54	16/8	794.04
Service charges	9.95		16/8	784.09
Cheque 202	587.24		17/8	196.85
Deposit		812.56	18/8	1009.41

   2. Check off all transactions that appear on the bank statement, and correct any errors.

Date	No.	Description	Debit	Credit	✓	Balance
		Balance forward			✓	525.00
4/5	124	David's Gift Shop	19.00		✓	506.00
9/5		Paycheque		116.00	✓	622.00
13/5	125	B.C. Tel	43.00		✓	579.00
14/5	126	Pete's Garage	58.00		✓	521.00
18/5	127	Bookstore Unlimited	50.00		✓	471.00
26/5	128	United Way	25.00			446.00
28/5	129	Wayside Apartments	275.00			171.00
30/5		Paycheque		1000.00		1171.00
15/5		Printed cheques	8.00		✓	1163.00
16/5		Error in entry of 14/5	10.00		✓	1153.00
31/5		Service charges	12.00		✓	1141.00

Notice the error in the entry for 14/5. You need to make an adjustment of $\$68.00 - \$58.00 = \$10.00$ in the Debit column.

Add all uncleared deposits to the final balance on the bank statement and subtract all uncleared cheques or withdrawals.

$$\begin{aligned}\text{Bank reconciliation} &= \text{Statement balance} + \text{Deposits} - \text{Cheques and withdrawals}\\ &= \$441.00 + \$1000.00 - (\$25.00 + \$275.00)\\ &= \$441.00 + 1000.00 - \$300.00\\ &= \$1141.00\end{aligned}$$

Compare this result with the balance from the transaction record. Both balances are $1141.00; therefore, the transaction record is reconciled with the bank statement.

3. Textbook exercises 1 to 10 of "Investigation 2: Balancing the Till," pp. 245 and 246

1. A float is necessary so the store can make change for customers making cash purchases. It is important that you know the amount of the float so you can determine the total cash receipts for the day.

2. At the end of the day, subtract the value of the float from the total cash in the cash register to determine the amount of cash taken in that day.

3. At the end of the day, you should add the purchases made using a credit card or a debit card to the cash and cheques to determine the daily revenue.

4. When calculating daily sales, subtract the value of any refund from your total to determine the daily sales.

5. There is no answer required for exercise 5.

6. $$\begin{aligned}\text{Total Float} &= \$0.50 + \$1.50 + \$3.00 + \$5.00 + \$10.00 + \$20.00 + \$10.00 + \$50.00 + \$100.00\\ &= \$200.00\end{aligned}$$

Activity 4 (continued)

7.

Float		Take	
	Value ($)		**Value ($)**
50 × 1¢ =	0.50	65 × 1¢ =	0.65
30 × 5¢ =	1.50	29 × 5¢ =	1.45
30 × 10¢ =	3.00	37 × 10¢ =	3.70
20 × 25¢ =	5.00	39 × 25¢ =	9.75
10 × $1 =	10.00	9 × $1 =	9.00
10 × $2 =	20.00	12 × $2 =	24.00
2 × $5 =	10.00	11 × $5 =	55.00
5 × $10 =	50.00	11 × $10 =	110.00
5 × $20 =	100.00	12 × $20 =	240.00
		2 × $50 =	100.00
Total Float	200.00	**Total Cash**	553.55
		Cheques	252.31
		Direct Debit	188.14
		Credit Card	15.63 105.00 95.00
		Subtotal	1209.63
		Refunds	12.39
		Total Take	1197.24

The subtotal is not equal to the total value of the day’s sales because it includes the float.

$$\begin{aligned}\therefore \text{ Total day's sales} &= \$1209.63 - \$200.00 \\ &= \$1009.63\end{aligned}$$

8. $$\begin{aligned}\text{Net sales} &= \text{Total take} - \text{Total float}\\ &= \$1197.24 - \$200.00\\ &= \$997.24\end{aligned}$$

9. The owner should total the transactions on the tape to see whether they match the net sales revenue for the day.

10. If the till and tape do not balance, the owner should check the cheques and the credit-card and debit-card transactions against the tape to see whether any of the amounts are incorrect. The owner should also recount the cash. However, it is possible that an incorrect amount of change was given to a cash customer.

4. a. Textbook exercise 3 of "Discussing the Ideas," p. 247

3. Sales receipts and cash-register takes may not balance because the cashier may not have given the correct change to a cash customer. Also, an incorrect amount may have been entered on a cheque or in a debit- or credit-card transaction.

b. Textbook exercises 3 and 4 of "Exercises: Checking Your Skills," pp. 248 and 249

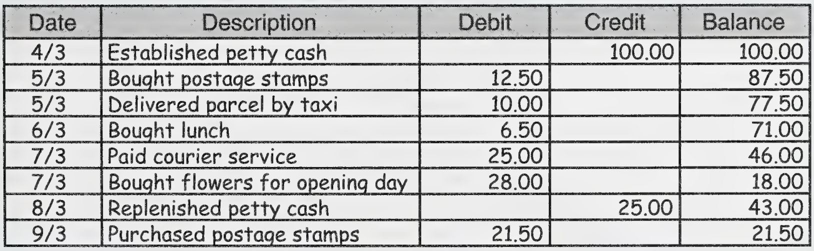
3. $$\begin{aligned}\text{Total cash} &= \$0.89 + \$1.85 + \$5.70 + \$9.75 + \$10.00 + \$38.00 + \$75.00 + \$210.00\\ &\quad + \$240.00 + \$150.00\\ &= \$741.19\end{aligned}$$

$$\begin{aligned}\therefore \text{Total take} &= \$741.19 + \$653.63 + \$440.45\\ &= \$1835.27\end{aligned}$$

Note: The answer in the textbook gives the net sales for the day, which is

$$\begin{aligned}\text{Net sales} &= \text{Total take} - \text{Total float}\\ &= \$1835.27 - \$305.66\\ &= \$1529.61\end{aligned}$$

4.



Date	Description	Debit	Credit	Balance
4/3	Established petty cash		100.00	100.00
5/3	Bought postage stamps	12.50		87.50
5/3	Delivered parcel by taxi	10.00		77.50
6/3	Bought lunch	6.50		71.00
7/3	Paid courier service	25.00		46.00
7/3	Bought flowers for opening day	28.00		18.00
8/3	Replenished petty cash		25.00	43.00
9/3	Purchased postage stamps	21.50		21.50

A balance of $20 is not correct. One of the entries could have been recorded incorrectly. Check the receipts for each entry.

Activity 4 (continued)

5. Textbook exercise "Communicating the Ideas," p. 249

To reconcile the till, follow these steps:

Step 1: Total the cash in the till.

Step 2: Total the cheques, credit-card receipts, and debit-card receipts.

Step 3: Find the total of the amounts from Steps 1 and 2.

Step 4: Subtract the value of the float from the total in Step 3. This is the net sales for the day.

Step 5: Compare the total net sales for the day against the cash-register tape.

Step 6. If the two amounts in Step 5 do not agree, look for entry errors and correct them if possible.

Activity 5: Interest

1. Textbook exercises 1 to 5 of "Investigation 1: Simple Interest," p. 250

1.
$$\begin{aligned}\text{Interest} &= 4\% \text{ of } \$100\\ &= 0.04 \times \$100\\ &= \$4.00\end{aligned}$$

In 1 year, you would earn $4.00 in interest.

2. After 2 years, the interest earned is $2 \times \$4.00 = \$8.00$.

After 5 years, the interest earned is $5 \times \$4.00 = \$20.00$.

After 10 years, the interest earned is $10 \times \$4.00 = \$40.00$.

3. After 6 months or $\frac{1}{2}$ year, the interest earned is $\frac{1}{2} \times \$4.00 = \$2.00$.

After 3 months or $\frac{1}{4}$ year, the interest earned is $\frac{1}{4} \times \$4.00 = \$1.00$.

After 1 month or $\frac{1}{12}$ year, the interest earned is $\frac{1}{12} \times \$4.00 = \$0.33$.

4. First, change 40 days to a fraction of a year.

$$40 \text{ days} = \frac{40}{365} \text{ years}$$

Then, multiply the interest for one year by $\frac{40}{365}$.

$$\begin{aligned}\text{Interest} &= \frac{40}{365} \times \$4.00 \\ &= \$0.44\end{aligned}$$

5. Interest = Principal × Annual interest rate × Time (in years)

$$I = Prt$$

2. a.

$$\begin{aligned} I &= Prt \\ Prt &= I \\ \frac{Prt}{Pt} &= \frac{I}{Pt} \\ r &= \frac{I}{Pt} \end{aligned}$$

b.

$$\begin{aligned} I &= Prt \\ \frac{Prt}{Pr} &= \frac{I}{Pr} \\ t &= \frac{I}{Pr} \end{aligned}$$

3. Textbook exercise 1 of "Exercises: Checking Your Skills," p. 255

1.

Investment	Amount of Simple Interest ($)	Principal ($)	Annual Interest Rate (%)	Time (years)
a	101.25	500.00	6.75	3
b	42.53	945.11	4.50	1
c	102.38	4500.00	3.25	0.7
d	1250.00	10 000.00	5.00	2.5

Formulas

← $I = Prt$

← $P = \frac{I}{rt}$

← $t = \frac{I}{Pr}$

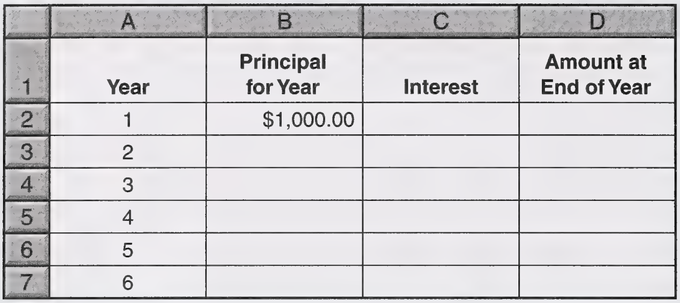
← $r = \frac{I}{Pt}$

Note: In d., the calculator gives the rate as a decimal. Multiply this number by 100 to convert it to a percent.

Activity 5 (continued)

4. Textbook exercises 1 to 10 of "Investigation 2: Compound Interest," pp. 252 and 253

1. and 2.



	A	B	C	D
1	Year	Principal for Year	Interest	Amount at End of Year
2	1	$1,000.00		
3	2			
4	3			
5	4			
6	5			
7	6			

3. $I = Prt$

$$= 1000(0.05)(1)$$

$$= \$50$$

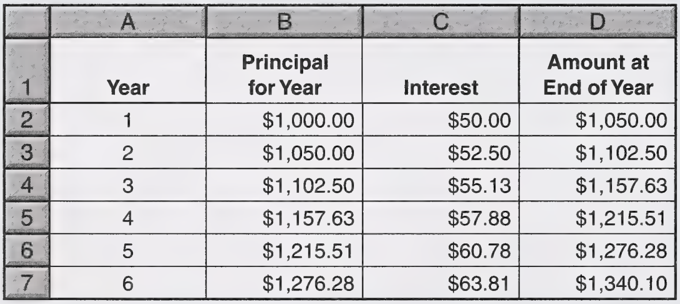
$$\therefore \text{ Amount} = \text{Principal} + \text{Interest}$$

$$= \$1000 + \$50$$

$$= \$1050$$

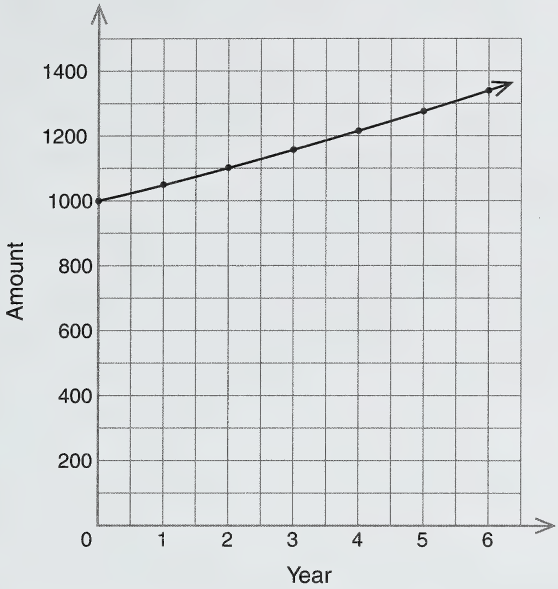
4. The principal for year 2 is $1050.

5.



	A	B	C	D
1	Year	Principal for Year	Interest	Amount at End of Year
2	1	$1,000.00	$50.00	$1,050.00
3	2	$1,050.00	$52.50	$1,102.50
4	3	$1,102.50	$55.13	$1,157.63
5	4	$1,157.63	$57.88	$1,215.51
6	5	$1,215.51	$60.78	$1,276.28
7	6	$1,276.28	$63.81	$1,340.10

6.



7. Multiply the principal at the beginning of the year by the factor 1.05.

8. $\$1000(1.05) = \$1050.00$

$\$1050(1.05) = \$1102.50$

$\$1102.50(1.05) = \$1157.63$

$\$1157.63(1.05) = \$1215.51$

$\$1215.51(1.05) = \$1276.28$

$\$1276.28(1.05) = \$1340.10$

Activity 5 (continued)

9.

Year	Amount at End of Year	
1	$1000(1.05) = 1000(1.05)^1$	← $1050.00
2	$1000(1.05)(1.05) = 1000(1.05)^2$	← $1102.50
3	$1000(1.05)(1.05)(1.05) = 1000(1.05)^3$	← $1151.63
4	$1000(1.05)(1.05)(1.05)(1.05) = 1000(1.05)^4$	← $1215.51
5	$1000(1.05)(1.05)(1.05)(1.05)(1.05) = 1000(1.05)^5$	← $1276.28
6	$1000(1.05)(1.05)(1.05)(1.05)(1.05)(1.05) = 1000(1.05)^6$	← $1340.10

10. The amount, A, at the end of year 9 is calculated using the following expression:

$$A = 1000(1.05)^9$$

5. Textbook exercises 2, 3.b., 4.a., and 5 of "Exercises: Checking Your Skills," pp. 255 and 256

2.

Year	Amount at End of Year	Value ($)
1	$450(1.045)^1$	470.25
2	$450(1.045)^2$	491.41
3	$450(1.045)^3$	513.52
4	$450(1.045)^4$	536.63
5	$450(1.045)^5$	560.78

3. **b.** Use the compound interest formula, $A = P(1+i)^n$.

$P = \$100$, $i = 0.0525$, and $n = 10$

$$\begin{aligned} \therefore\ A &= \$100(1+0.0525)^{10} \\ &= \$100(1.0525)^{10} \\ &= \$166.81 \end{aligned}$$

The amount at the end of 10 years is \$166.81.

4. **a.** Use the compound interest formula, $A = P(1+i)^n$.

$P = \$1500$, $i = 0.06$, and $n = 4$

$$\begin{aligned} \therefore\ A &= \$1500(1+0.06)^{4} \\ &= \$1500(1.06)^{4} \\ &= \$1893.72 \end{aligned}$$

The amount at the end of 4 years is \$1893.72. Therefore, the amount of interest earned is $\$1893.72 - \$1500.00 = \$393.72$.

5. Use the compound interest formula, $A = P(1+i)^n$.

$P = \$500$, $i = 0.08$, and $n = 7$

$$\begin{aligned} \therefore\ A &= \$500(1+0.08)^{7} \\ &= \$500(1.08)^{7} \\ &= \$856.91 \end{aligned}$$

The value of the \$500 bond at the end of 7 years is \$856.91.

6. Textbook exercise "Communicating the Ideas," p. 257

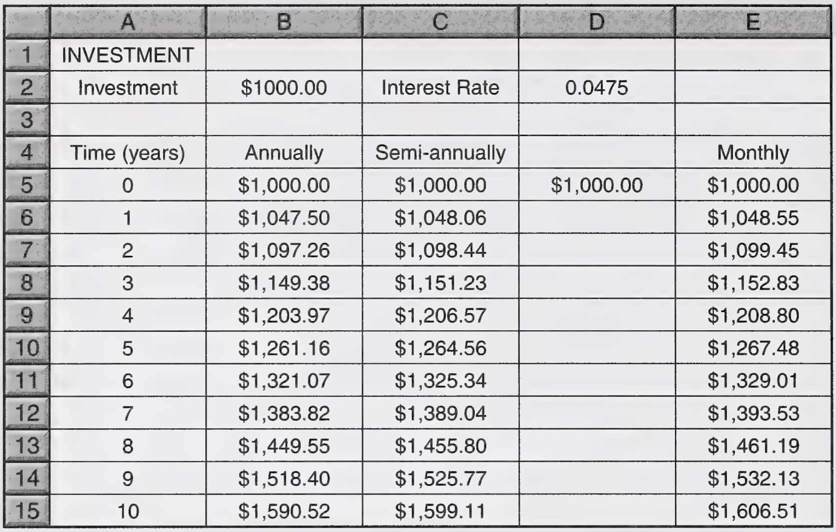
Simple interest is money paid, at a predetermined percent, for the use of money. The formula for simple interest $(I = Prt)$, when applied, will give twice the interest if the term is doubled or three times the interest if the term is tripled, and so on.

Compound interest, like simple interest, is money paid for the use of money. However, unlike simple interest, the interest earned is added to the principal at the end of each interest period. This new amount becomes the principal for the next interest period, and so on. Since interest earns interest, the amount grows more quickly for compound interest than for simple interest.

Activity 6: Computer Lab: Compound Interest

1. Textbook exercises 1 to 10 of Tutorial 5.6, "Computer Lab: Compound Interest," pp. 259 and 260

1. and 2. Your spreadsheet should look like the following.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1000.00	Interest Rate	0.0475	
3					
4	Time (years)	Annually	Semi-annually		Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,047.50	$1,048.06		$1,048.55
7	2	$1,097.26	$1,098.44		$1,099.45
8	3	$1,149.38	$1,151.23		$1,152.83
9	4	$1,203.97	$1,206.57		$1,208.80
10	5	$1,261.16	$1,264.56		$1,267.48
11	6	$1,321.07	$1,325.34		$1,329.01
12	7	$1,383.82	$1,389.04		$1,393.53
13	8	$1,449.55	$1,455.80		$1,461.19
14	9	$1,518.40	$1,525.77		$1,532.13
15	10	$1,590.52	$1,599.11		$1,606.51

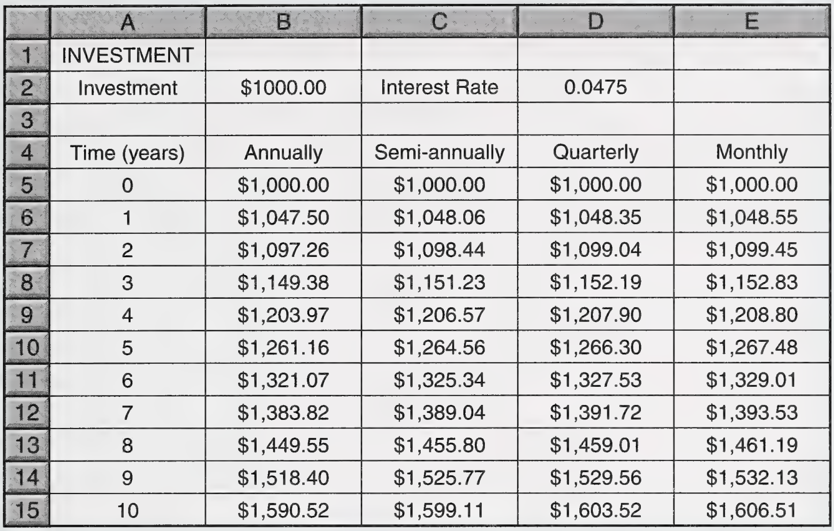
3. The cell location denoted by $B$5, $C$5, $D$2, and $E$5 remain the same. These values do not change when you fill down.

The numbers used in cell C6 for semi-annual compounding are 2s, because semi-annual interest is calculated 2 times a year.

4. The annual interest rate is divided by 12 in cell E6 because monthly interest is calculated 12 times a year. The interest rate for each month is the nominal annual rate divided by 12.

5. The formula in cell D6 is as follows:

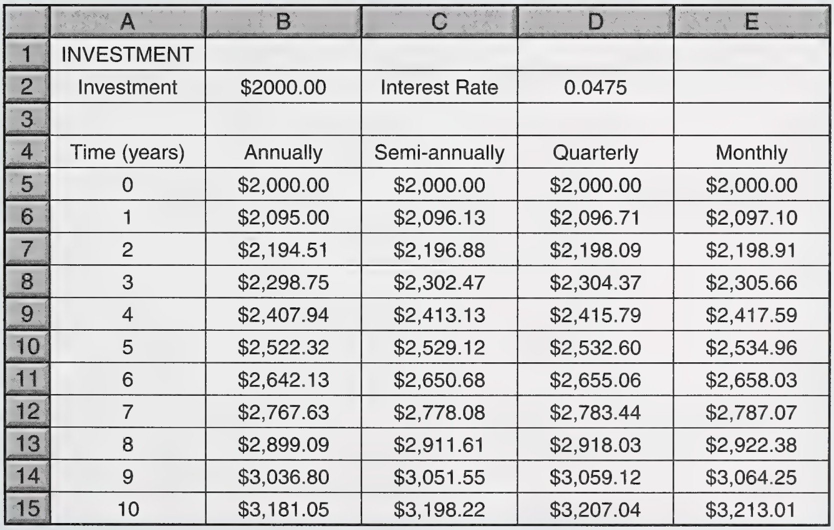
=$D$5*(1+($D$2/4))^(A6*4)



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1000.00	Interest Rate	0.0475	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,047.50	$1,048.06	$1,048.35	$1,048.55
7	2	$1,097.26	$1,098.44	$1,099.04	$1,099.45
8	3	$1,149.38	$1,151.23	$1,152.19	$1,152.83
9	4	$1,203.97	$1,206.57	$1,207.90	$1,208.80
10	5	$1,261.16	$1,264.56	$1,266.30	$1,267.48
11	6	$1,321.07	$1,325.34	$1,327.53	$1,329.01
12	7	$1,383.82	$1,389.04	$1,391.72	$1,393.53
13	8	$1,449.55	$1,455.80	$1,459.01	$1,461.19
14	9	$1,518.40	$1,525.77	$1,529.56	$1,532.13
15	10	$1,590.52	$1,599.11	$1,603.52	$1,606.51

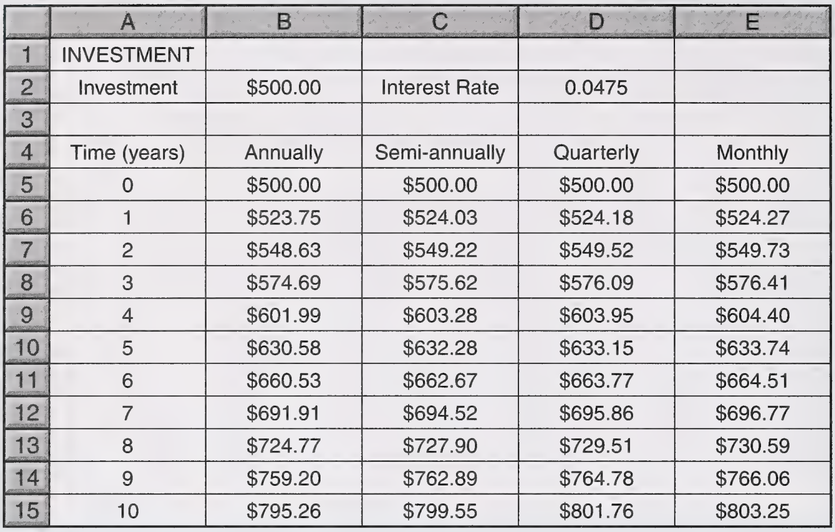
6. The more times interest is calculated during the year, the higher the final amount will be after 10 years.

7. **a.** Simply change cell B2 to $2000.00. Your spreadsheet should now look like the following.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$2000.00	Interest Rate	0.0475	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$2,000.00	$2,000.00	$2,000.00	$2,000.00
6	1	$2,095.00	$2,096.13	$2,096.71	$2,097.10
7	2	$2,194.51	$2,196.88	$2,198.09	$2,198.91
8	3	$2,298.75	$2,302.47	$2,304.37	$2,305.66
9	4	$2,407.94	$2,413.13	$2,415.79	$2,417.59
10	5	$2,522.32	$2,529.12	$2,532.60	$2,534.96
11	6	$2,642.13	$2,650.68	$2,655.06	$2,658.03
12	7	$2,767.63	$2,778.08	$2,783.44	$2,787.07
13	8	$2,899.09	$2,911.61	$2,918.03	$2,922.38
14	9	$3,036.80	$3,051.55	$3,059.12	$3,064.25
15	10	$3,181.05	$3,198.22	$3,207.04	$3,213.01

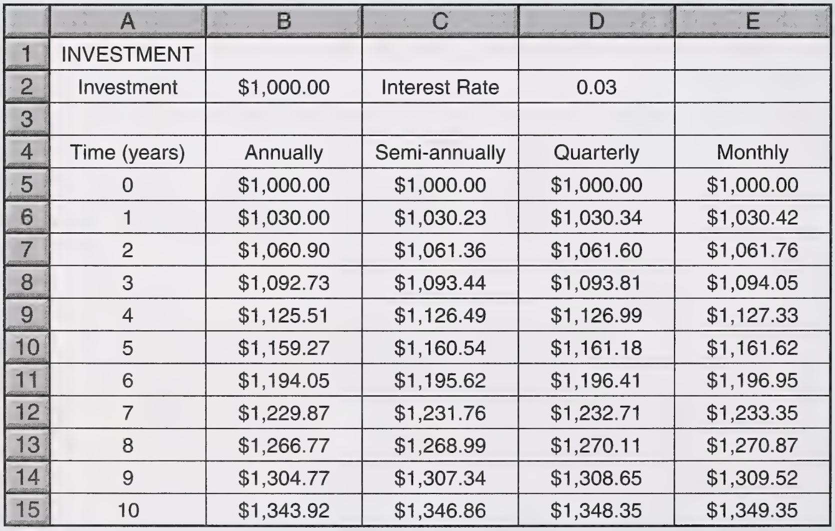
b. Change cell B2 to $500.00. Your spreadsheet should look like the following.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$500.00	Interest Rate	0.0475	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$500.00	$500.00	$500.00	$500.00
6	1	$523.75	$524.03	$524.18	$524.27
7	2	$548.63	$549.22	$549.52	$549.73
8	3	$574.69	$575.62	$576.09	$576.41
9	4	$601.99	$603.28	$603.95	$604.40
10	5	$630.58	$632.28	$633.15	$633.74
11	6	$660.53	$662.67	$663.77	$664.51
12	7	$691.91	$694.52	$695.86	$696.77
13	8	$724.77	$727.90	$729.51	$730.59
14	9	$759.20	$762.89	$764.78	$766.06
15	10	$795.26	$799.55	$801.76	$803.25

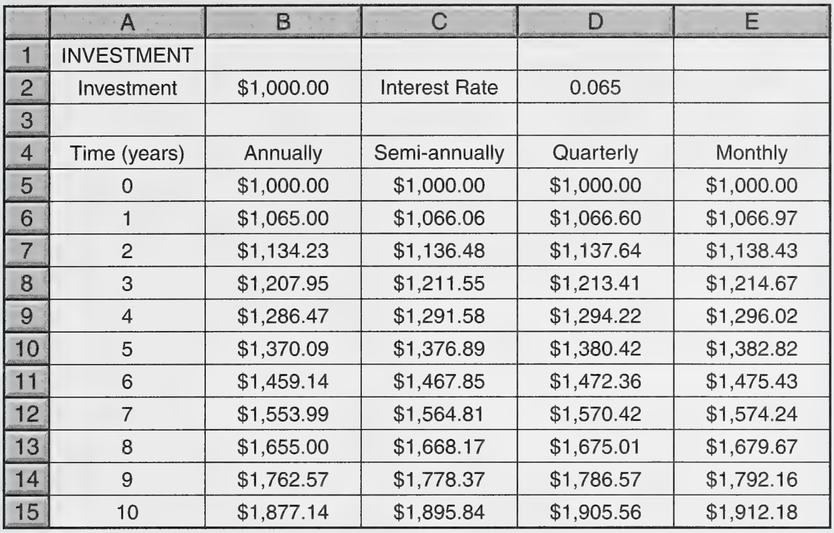
When the principal of $1000 is doubled to $2000, the final amounts after 10 years are doubled. When the principal of $1000 is halved to $500, the final amounts after 10 years are halved.

8. **a.** Change cell B2 back to $1000.00, and change cell D2 to 0.03. Your spreadsheet should look like the following.



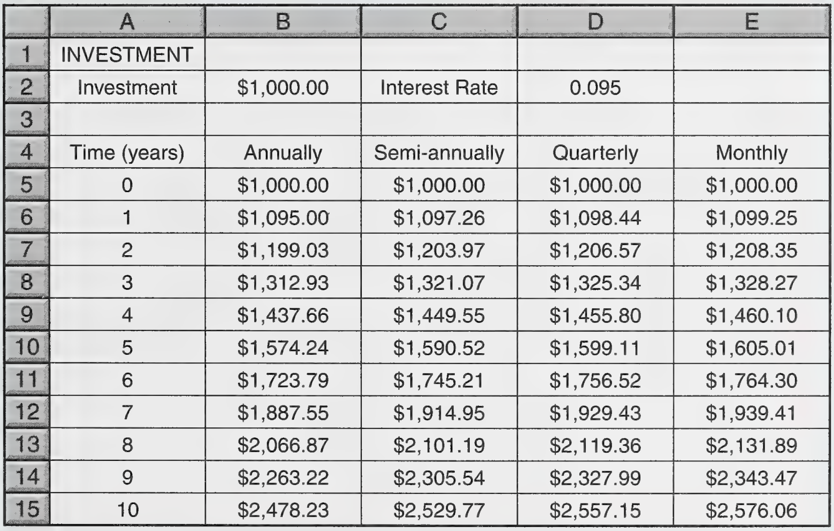
	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1,000.00	Interest Rate	0.03	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,030.00	$1,030.23	$1,030.34	$1,030.42
7	2	$1,060.90	$1,061.36	$1,061.60	$1,061.76
8	3	$1,092.73	$1,093.44	$1,093.81	$1,094.05
9	4	$1,125.51	$1,126.49	$1,126.99	$1,127.33
10	5	$1,159.27	$1,160.54	$1,161.18	$1,161.62
11	6	$1,194.05	$1,195.62	$1,196.41	$1,196.95
12	7	$1,229.87	$1,231.76	$1,232.71	$1,233.35
13	8	$1,266.77	$1,268.99	$1,270.11	$1,270.87
14	9	$1,304.77	$1,307.34	$1,308.65	$1,309.52
15	10	$1,343.92	$1,346.86	$1,348.35	$1,349.35

b. Change cell D2 to 0.065. Your spreadsheet should look like the following.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1,000.00	Interest Rate	0.065	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,065.00	$1,066.06	$1,066.60	$1,066.97
7	2	$1,134.23	$1,136.48	$1,137.64	$1,138.43
8	3	$1,207.95	$1,211.55	$1,213.41	$1,214.67
9	4	$1,286.47	$1,291.58	$1,294.22	$1,296.02
10	5	$1,370.09	$1,376.89	$1,380.42	$1,382.82
11	6	$1,459.14	$1,467.85	$1,472.36	$1,475.43
12	7	$1,553.99	$1,564.81	$1,570.42	$1,574.24
13	8	$1,655.00	$1,668.17	$1,675.01	$1,679.67
14	9	$1,762.57	$1,778.37	$1,786.57	$1,792.16
15	10	$1,877.14	$1,895.84	$1,905.56	$1,912.18

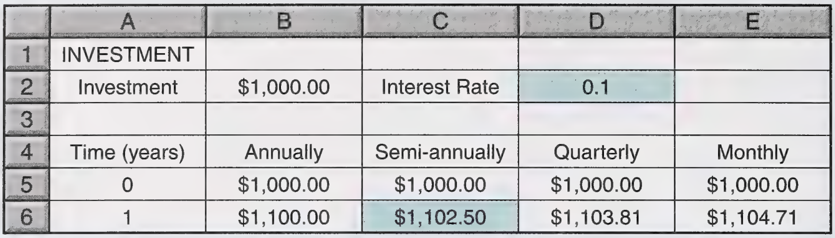
c. Change cell D2 to 0.095. Your spreadsheet should look like the following.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1,000.00	Interest Rate	0.095	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,095.00	$1,097.26	$1,098.44	$1,099.25
7	2	$1,199.03	$1,203.97	$1,206.57	$1,208.35
8	3	$1,312.93	$1,321.07	$1,325.34	$1,328.27
9	4	$1,437.66	$1,449.55	$1,455.80	$1,460.10
10	5	$1,574.24	$1,590.52	$1,599.11	$1,605.01
11	6	$1,723.79	$1,745.21	$1,756.52	$1,764.30
12	7	$1,887.55	$1,914.95	$1,929.43	$1,939.41
13	8	$2,066.87	$2,101.19	$2,119.36	$2,131.89
14	9	$2,263.22	$2,305.54	$2,327.99	$2,343.47
15	10	$2,478.23	$2,529.77	$2,557.15	$2,576.06

When the annual rate increases, the final amount increases. When the annual rate decreases, the final amount decreases.

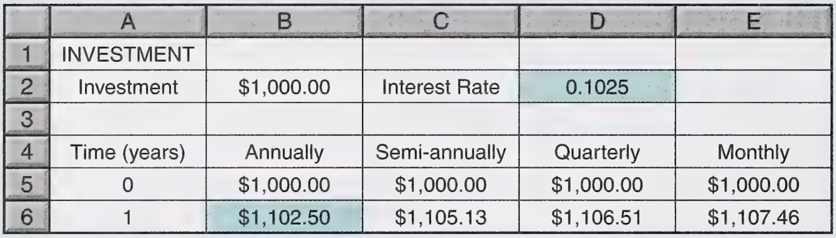
9. First, change cell D2 to 0.1 and determine the amount after 1 year, compounded semi-annually.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1,000.00	Interest Rate	0.1	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,100.00	$1,102.50	$1,103.81	$1,104.71

The amount after 1 year invested at 10%, compounded semi-annually, is $1102.50.

Now, change cell D2 to 0.1025 and determine the amount after 1 year, compounded annually.

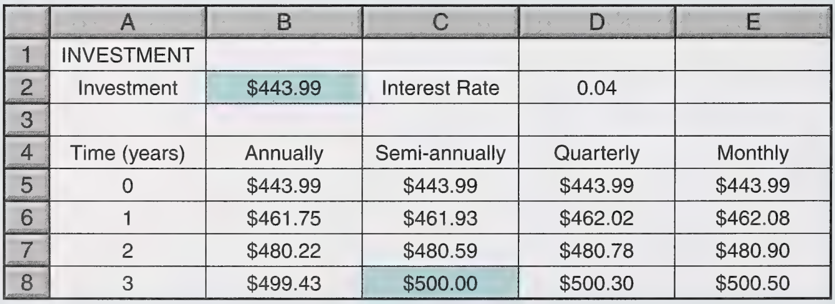


	A	B	C	D	E
1	INVESTMENT				
2	Investment	$1,000.00	Interest Rate	0.1025	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$1,000.00	$1,000.00	$1,000.00	$1,000.00
6	1	$1,102.50	$1,105.13	$1,106.51	$1,107.46

The amount after 1 year invested at 10.25%, compounded annually, is $1102.50.

Both investments will give the same return after 1 year.

10. Simply use trial and error (or guess and check) to find the principal (cell B2). **Remember:** Change cell D2 to 0.04.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$443.99	Interest Rate	0.04	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$443.99	$443.99	$443.99	$443.99
6	1	$461.75	$461.93	$462.02	$462.08
7	2	$480.22	$480.59	$480.78	$480.90
8	3	$499.43	$500.00	$500.30	$500.50

To accumulate to $500 in 3 years at an interest rate of 4%, compounded semi-annually, the principal must be $443.99.

2. a. **Textbook exercises 1 to 3 of "Discussing the Ideas," p. 261**

1. Banks are in business to make a profit. Because the total interest paid increases with the number of compounding periods, banks decrease the interest rate when the number of compounding periods increases. Otherwise, banks would reduce their potential profits.

2. Answers will vary. A sample answer is given.

Banks offer investments at different interest rates to attract customers who have different requirements. Generally, short-term investments offer lower rates of return. A person who is intending to purchase a car in 3 months may purchase a GIC for this term; then he or she may use the money from the account for a down payment on the vehicle.

To attract people's money for a longer term, say 5 years, the bank will have to compete with other institutions and offer higher rates on their GICs.

3. In the short term, an account with a higher interest rate compounded semi-annually will be more advantageous than one with a lower interest rate compounded monthly.

For example, an investment of \$1000 at 12%, compounded semi-annually, after 1 year will be worth

$$\begin{aligned} A &= \$1000\left(1+\frac{0.12}{2}\right)^2 \\ &= \$1000(1.06)^2 \\ &= \$1123.60 \end{aligned}$$

An investment of \$1000 at 11.5%, compounded monthly, after 1 year will only be worth

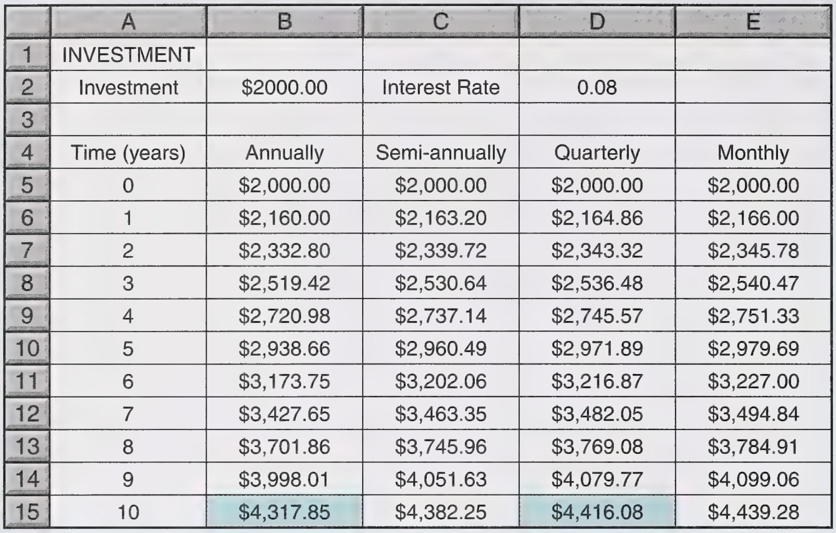
$$\begin{aligned} A &= \$1000\left(1+\frac{0.115}{12}\right)^{12} \\ &= \$1121.26 \end{aligned}$$

Note: For this situation, it will only take 3 years for the investment at 11.5%, compounded monthly, to be worth more than the investment at 12%, compounded annually.

Activity 6 (continued)

b. Textbook exercises 1, 2, 4.a., and 5 of "Exercises: Checking Your Skills," p. 262

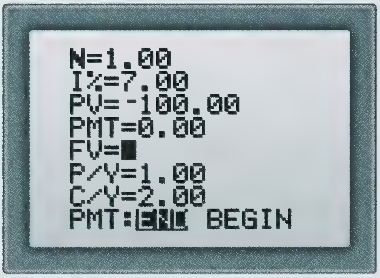
1.



	A	B	C	D	E
1	INVESTMENT				
2	Investment	$2000.00	Interest Rate	0.08	
3					
4	Time (years)	Annually	Semi-annually	Quarterly	Monthly
5	0	$2,000.00	$2,000.00	$2,000.00	$2,000.00
6	1	$2,160.00	$2,163.20	$2,164.86	$2,166.00
7	2	$2,332.80	$2,339.72	$2,343.32	$2,345.78
8	3	$2,519.42	$2,530.64	$2,536.48	$2,540.47
9	4	$2,720.98	$2,737.14	$2,745.57	$2,751.33
10	5	$2,938.66	$2,960.49	$2,971.89	$2,979.69
11	6	$3,173.75	$3,202.06	$3,216.87	$3,227.00
12	7	$3,427.65	$3,463.35	$3,482.05	$3,494.84
13	8	$3,701.86	$3,745.96	$3,769.08	$3,784.91
14	9	$3,998.01	$4,051.63	$4,079.77	$4,099.06
15	10	$4,317.85	$4,382.25	$4,416.08	$4,439.28

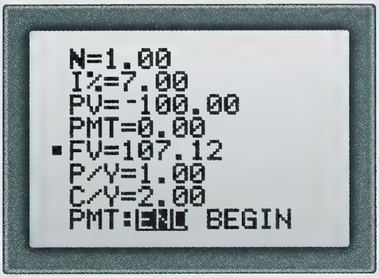
You would earn $\$4416.08 - \$4317.85 = \$98.23$ more in interest at the second bank.

2. a. Use your graphing calculator to determine the accumulated amount for $100 invested at 7%, compounded semi-annually, for 1 year. Access the TVM Solver, and enter the values shown in the following display.



```
N=1.00
I%=7.00
PV=-100.00
PMT=0.00
FV=■
P/Y=1.00
C/Y=2.00
PMT:END BEGIN
```

Move the cursor to FV, and press ALPHA [SOLVE].



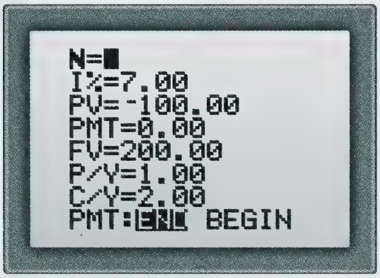
```
 N=1.00
 I%=7.00
 PV=-100.00
 PMT=0.00
▪FV=107.12
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

The effective interest rate is approximately 7.12%.

b. Since $72 \div 7 \doteq 10$, it will take about 10 years for the investment to double.

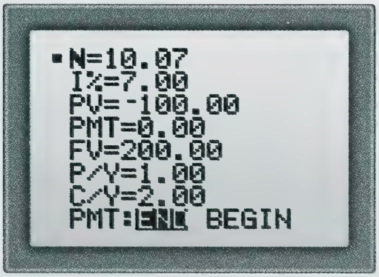
c. Use your graphing calculator to determine how long your investment of $100 will take to at least double to $200.

Access the TVM Solver, and enter the values shown in the following display.



```
N=█
I%=7.00
PV=-100.00
PMT=0.00
FV=200.00
P/Y=1.00
C/Y=2.00
PMT:END BEGIN
```

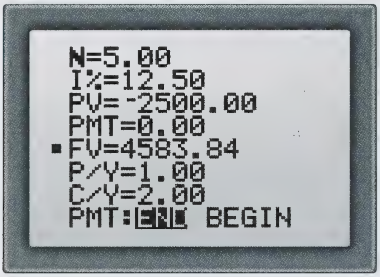
Move the cursor to N, and press ALPHA [SOLVE].



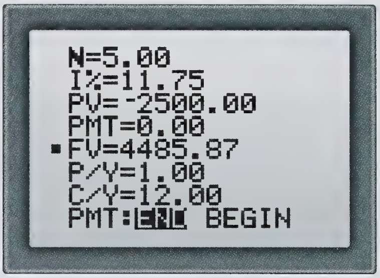
```
▪N=10.07
 I%=7.00
 PV=-100.00
 PMT=0.00
 FV=200.00
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

Because N is just over 10 years and because interest is calculated semi-annually, it will take 10.5 years for the investment of $100 to at least double to $200.

4. **a.** Use the TVM Solver on your graphing calculator to find the accumulated amount of $2500 invested for 5 years at each rate.



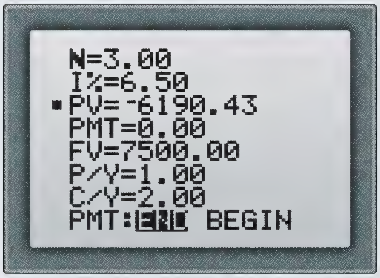
```
 N=5.00
 I%=12.50
 PV=-2500.00
 PMT=0.00
■FV=4583.84
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```



```
 N=5.00
 I%=11.75
 PV=-2500.00
 PMT=0.00
■FV=4485.87
 P/Y=1.00
 C/Y=12.00
 PMT:END BEGIN
```

The investment at 12.5%, compounded semi-annually, is better. Your earnings are $\$4583.84 - \$4485.87 = \$97.97$ greater.

5. Enter the values, and solve for PV.



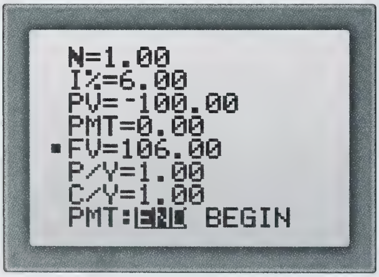
```
 N=3.00
 I%=6.50
■PV=-6190.43
 PMT=0.00
 FV=7500.00
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

To accumulate to $7500.00 in 3 years at 6.5%, compounded semi-annually, $6190.43 must be invested today.

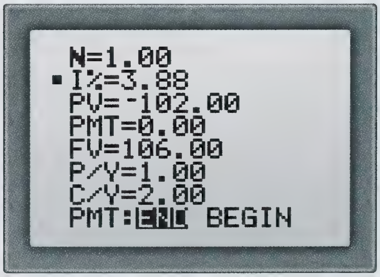
3. **Textbook exercise "Communicating the Ideas," p. 263**

After one year, two different investments at different interest rates can yield the same accumulated amount if the compounding periods are different.

Study the following displays.



```
 N=1.00
 I%=6.00
 PV=-100.00
 PMT=0.00
■FV=106.00
 P/Y=1.00
 C/Y=1.00
 PMT:END BEGIN
```



```
 N=1.00
■I%=3.88
 PV=-102.00
 PMT=0.00
 FV=106.00
 P/Y=1.00
 C/Y=2.00
 PMT:END BEGIN
```

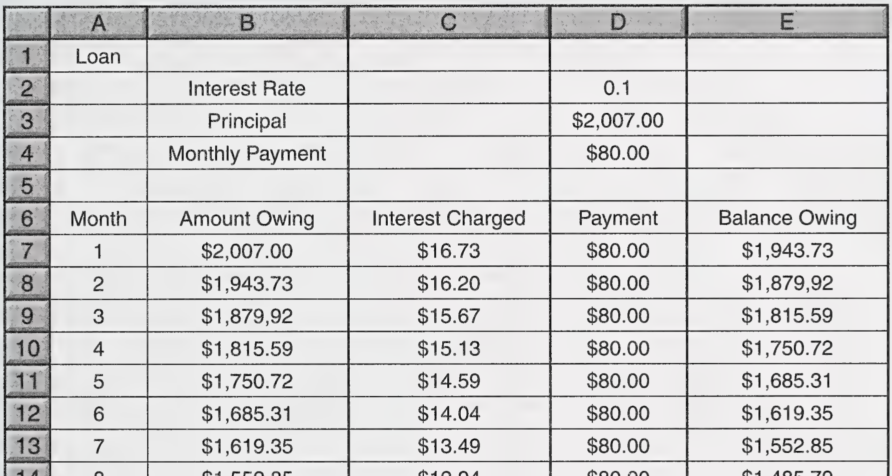
An investment of $100 will grow to $106 after 1 year at 6%, compounded annually. An investment of $102 will also grow to $106 after 1 year at 3.88%, compounded semi-annually.

Also, as seen earlier in the module, an investment of $1000 bearing an annual rate of 10.25%, compounded annually, resulted in the same return as an investment of $1000 bearing an annual rate of 10%, compounded semi-annually.

Activity 7: Computer Lab: Annuities

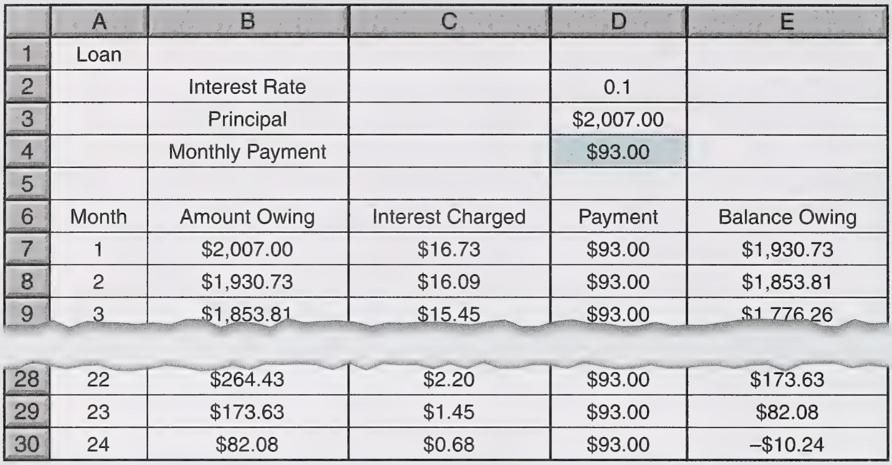
1. **Textbook exercises 1 to 5 of Tutorial 5.7, "Computer Lab: Annuities," pp. 264 and 265**

1. and 2. Your spreadsheet should look like the following.



	A	B	C	D	E
1	Loan				
2		Interest Rate		0.1	
3		Principal		$2,007.00	
4		Monthly Payment		$80.00	
5					
6	Month	Amount Owing	Interest Charged	Payment	Balance Owing
7	1	$2,007.00	$16.73	$80.00	$1,943.73
8	2	$1,943.73	$16.20	$80.00	$1,879,92
9	3	$1,879,92	$15.67	$80.00	$1,815.59
10	4	$1,815.59	$15.13	$80.00	$1,750.72
11	5	$1,750.72	$14.59	$80.00	$1,685.31
12	6	$1,685.31	$14.04	$80.00	$1,619.35
13	7	$1,619.35	$13.49	$80.00	$1,552.85
14	8	$1,552.85	$12.94	$80.00	$1,485.79
15	9	$1,485.79	$12.38	$80.00	$1,418.17
16	10	$1,418.17	$11.82	$80.00	$1,349.99
17	11	$1,349.99	$11.25	$80.00	$1,281.24
18	12	$1,281.24	$10.68	$80.00	$1,211.91
19	13	$1,211.91	$10.10	$80.00	$1,142.01
20	14	$1,142.01	$9.52	$80.00	$1,071.53
21	15	$1,071.53	$8.93	$80.00	$1,000.46
22	16	$1,000.46	$8.34	$80.00	$928.80
23	17	$928.80	$7.74	$80.00	$856.54
24	18	$856.54	$7.14	$80.00	$783.67
25	19	$783.67	$6.53	$80.00	$710.20
26	20	$710.20	$5.92	$80.00	$636.12
27	21	$636.12	$5.30	$80.00	$561.42
28	22	$561.42	$4.68	$80.00	$486.10
29	23	$486.10	$4.05	$80.00	$410.15
30	24	$410.15	$3.42	$80.00	$333.57

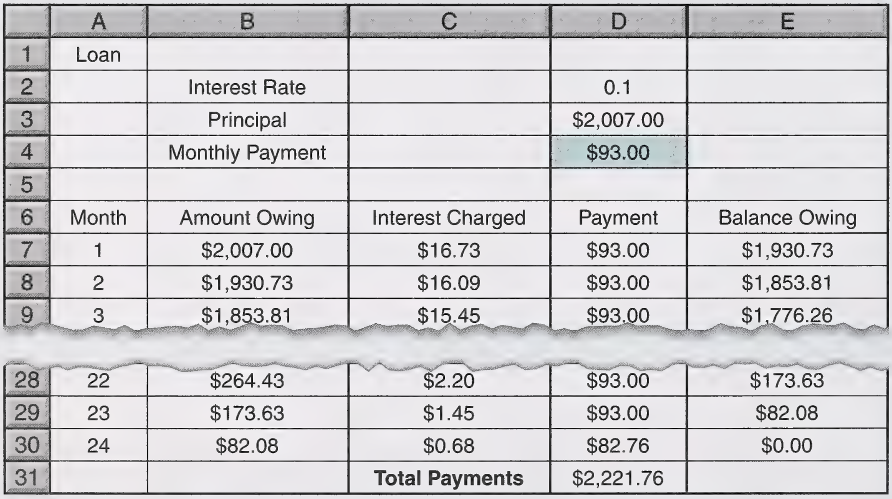
3. Use trial and error to determine the monthly payment (to the nearest dollar) that will yield a balance owing closest to $0 after 24 months.



	A	B	C	D	E
1	Loan				
2		Interest Rate		0.1	
3		Principal		$2,007.00	
4		Monthly Payment		$93.00	
5					
6	Month	Amount Owing	Interest Charged	Payment	Balance Owing
7	1	$2,007.00	$16.73	$93.00	$1,930.73
8	2	$1,930.73	$16.09	$93.00	$1,853.81
9	3	$1,853.81	$15.45	$93.00	$1,776.26
28	22	$264.43	$2.20	$93.00	$173.63
29	23	$173.63	$1.45	$93.00	$82.08
30	24	$82.08	$0.68	$93.00	–$10.24

The monthly payment should be $93.00.

4. Adjust the final payment so that the balance owing after 24 months is $0.00. Then sum all the entries in the Payment column.



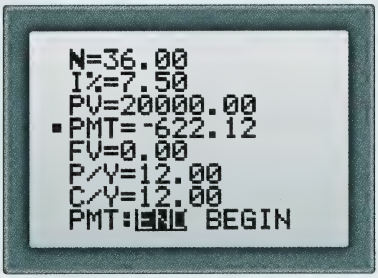
	A	B	C	D	E
1	Loan				
2		Interest Rate		0.1	
3		Principal		$2,007.00	
4		Monthly Payment		$93.00	
5					
6	Month	Amount Owing	Interest Charged	Payment	Balance Owing
7	1	$2,007.00	$16.73	$93.00	$1,930.73
8	2	$1,930.73	$16.09	$93.00	$1,853.81
9	3	$1,853.81	$15.45	$93.00	$1,776.26
28	22	$264.43	$2.20	$93.00	$173.63
29	23	$173.63	$1.45	$93.00	$82.08
30	24	$82.08	$0.68	$82.76	$0.00
31			**Total Payments**	$2,221.76	

The final payment will be $82.76, and the sum of all the payments is $2221.76.

5. Finance charges = Total payments – Principal
= \$2221.76 – \$2007.00
= \$214.76

2. a. **Textbook exercises 2 and 3 of "Discussing the Ideas," p. 268**

2. Access the TVM Solver; enter the values; and solve for PMT.



```
 N=36.00
 I%=7.50
 PV=20000.00
▪PMT=-622.12
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

The present value of the loan is \$20 000. This value is positive because it is money you received to purchase the car.

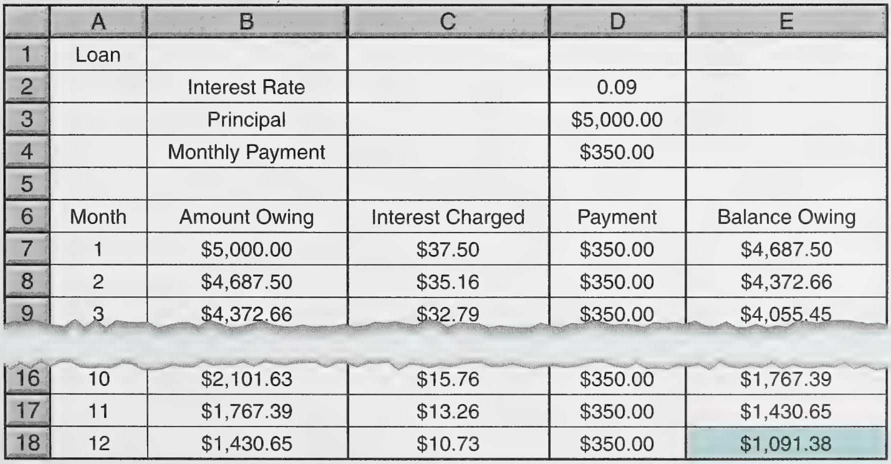
The monthly payment is \$622.12.

The amount of the loan is entered as a present value because it is money you receive from the bank. The future value of the loan should be \$0 when it is paid off.

3. Banks usually require a car loan to be repaid over 3 to 5 years because vehicles depreciate quickly. If an owner of a vehicle defaults on his or her car loan, banks want to be in a position to repossess and sell the vehicle to recover as much of the balance owing on the loan as possible.

b. **Textbook exercises 1, 2, 3, 4, 5.b., 6, and 7 of "Exercises: Checking Your Skills," pp. 269 and 270**

1.

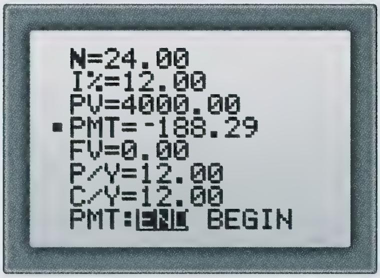


	A	B	C	D	E
1	Loan				
2		Interest Rate		0.09	
3		Principal		\$5,000.00	
4		Monthly Payment		\$350.00	
5					
6	Month	Amount Owing	Interest Charged	Payment	Balance Owing
7	1	\$5,000.00	\$37.50	\$350.00	\$4,687.50
8	2	\$4,687.50	\$35.16	\$350.00	\$4,372.66
9	3	\$4,372.66	\$32.79	\$350.00	\$4,055.45
16	10	\$2,101.63	\$15.76	\$350.00	\$1,767.39
17	11	\$1,767.39	\$13.26	\$350.00	\$1,430.65
18	12	\$1,430.65	\$10.73	\$350.00	\$1,091.38

After 12 payments, Adele still owes \$1091.38.

Activity 7 (continued)

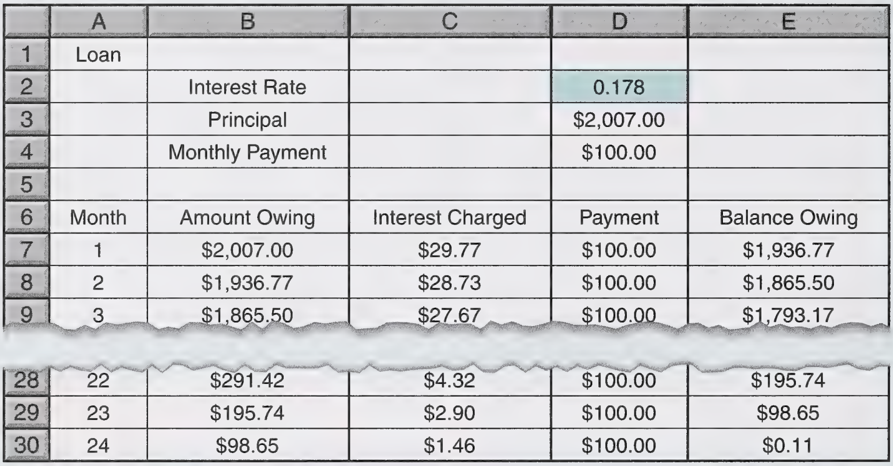
2. Using the TVM Solver on your graphing calculator, enter the known values and solve for PMT.



```
 N=24.00
 I%=12.00
 PV=4000.00
▪PMT=-188.29
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

The monthly payment is $188.29.

3. Use trial and error to determine the interest rate that yields a balance owing closest to $0.00.

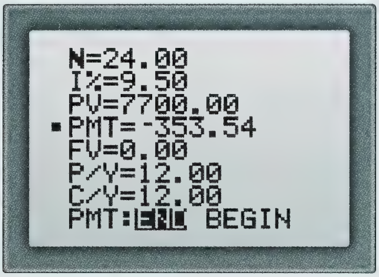


	A	B	C	D	E
1	Loan				
2		Interest Rate		0.178	
3		Principal		$2,007.00	
4		Monthly Payment		$100.00	
5					
6	Month	Amount Owing	Interest Charged	Payment	Balance Owing
7	1	$2,007.00	$29.77	$100.00	$1,936.77
8	2	$1,936.77	$28.73	$100.00	$1,865.50
9	3	$1,865.50	$27.67	$100.00	$1,793.17
28	22	$291.42	$4.32	$100.00	$195.74
29	23	$195.74	$2.90	$100.00	$98.65
30	24	$98.65	$1.46	$100.00	$0.11

If Craig's payments are not to exceed $100 per month, the highest annual interest rate he can afford is 17.8%.

4. Ravi will borrow $\$12\,200 - \$4500 = \$7700$.

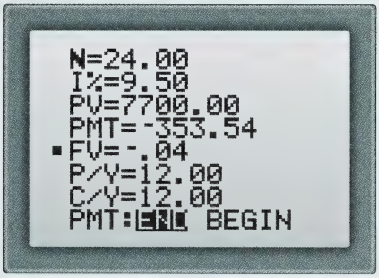
Using the TVM Solver on your graphing calculator, enter the known values and solve for PMT.



```
 N=24.00
 I%=9.50
 PV=7700.00
▪PMT=-353.54
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

Ravi's monthly payment is $353.54.

Because the monthly payment is a rounded value, determine the adjustment to the last payment by using the TVM Solver and solving for FV. **Remember:** You must re-enter the payment, $353.54.



```
 N=24.00
 I%=9.50
 PV=7700.00
 PMT=-353.54
▪FV=-.04
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

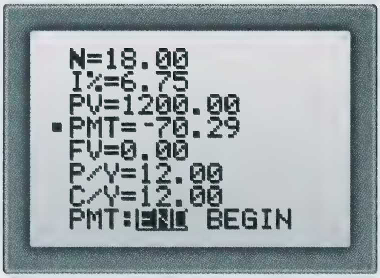
Because the future value shows that $0.04 (or 4¢) is still outstanding, the final payment will be $353.58.

$$\begin{aligned}\therefore \text{ Total cost of loan} &= 23 \times \$353.54 + \$353.58 \\ &= \$8131.42 + \$353.58 \\ &= \$8485.00\end{aligned}$$

$$\begin{aligned}\therefore \text{ Finance Charge} &= \text{Total cost of loan} - \text{Loan} \\ &= \$8485.00 - \$7700.00 \\ &= \$785.00\end{aligned}$$

The finance charge is $785.00.

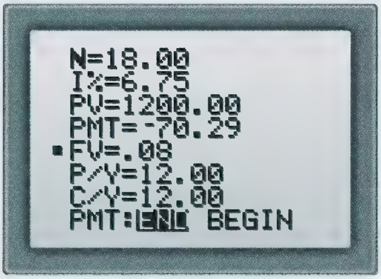
5. **b.** Using the TVM solver on your graphing calculator, enter the known values and solve for PMT.



```
 N=18.00
 I%=6.75
 PV=1200.00
▪PMT=-70.29
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

The monthly payments are \$70.29.

Determine the adjustment to be made to the final payment.



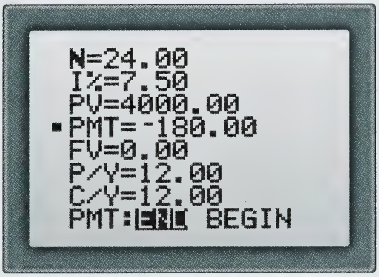
```
 N=18.00
 I%=6.75
 PV=1200.00
 PMT=-70.29
▪FV=.08
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

Because $\text{FV} = 0.08$, the final payment is \$70.21.

$$\begin{aligned}\therefore\ \text{Total cost of loan} &= 17 \times \$70.29 + \$70.21 \\ &= \$1265.14\end{aligned}$$

6. $$\begin{aligned}\text{Finance charges} &= \text{Total cost of loan} - \text{Loan} \\ &= \$1265.14 - \$1200.00 \\ &= \$65.14\end{aligned}$$

7. Using the TVM Solver, enter the known values and solve for PMT.

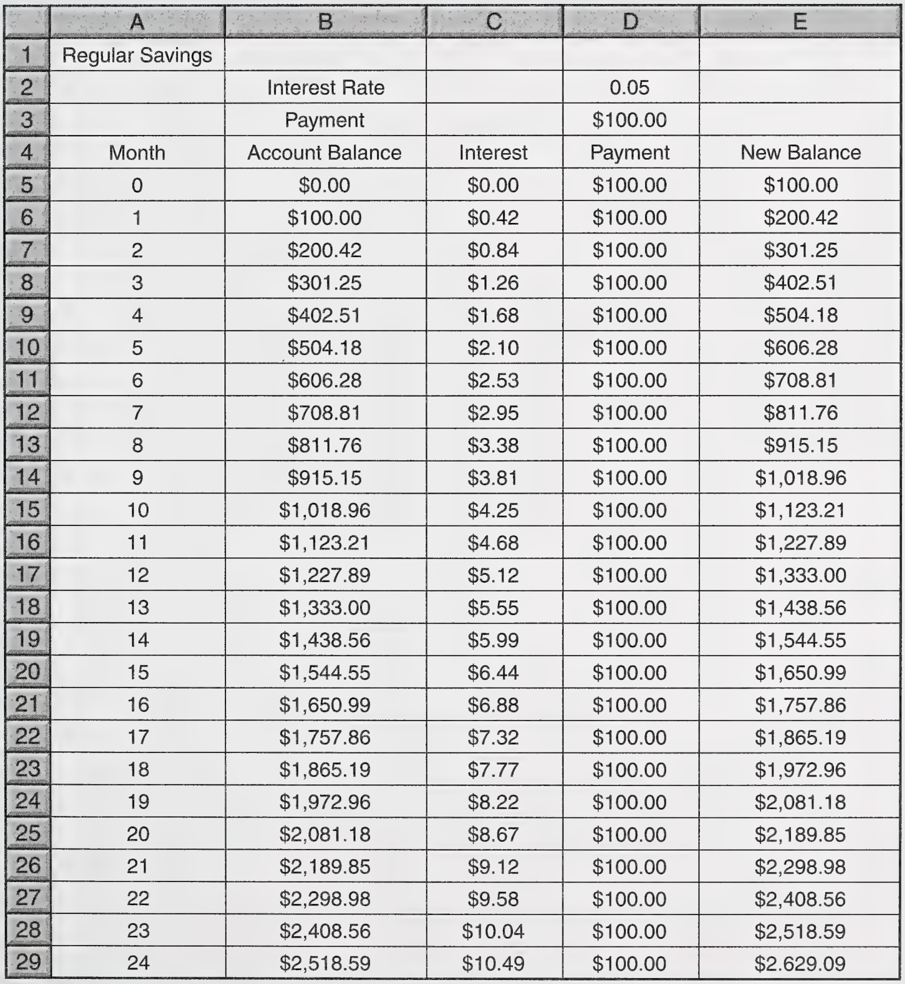


```
N=24.00
I%=7.50
PV=4000.00
▪PMT=-180.00
FV=0.00
P/Y=12.00
C/Y=12.00
PMT:END BEGIN
```

The family must make monthly payments of $180.00.

3. **Textbook exercises 6 to 11 of Tutorial 5.7, "Computer Lab: Annuities," p. 265**

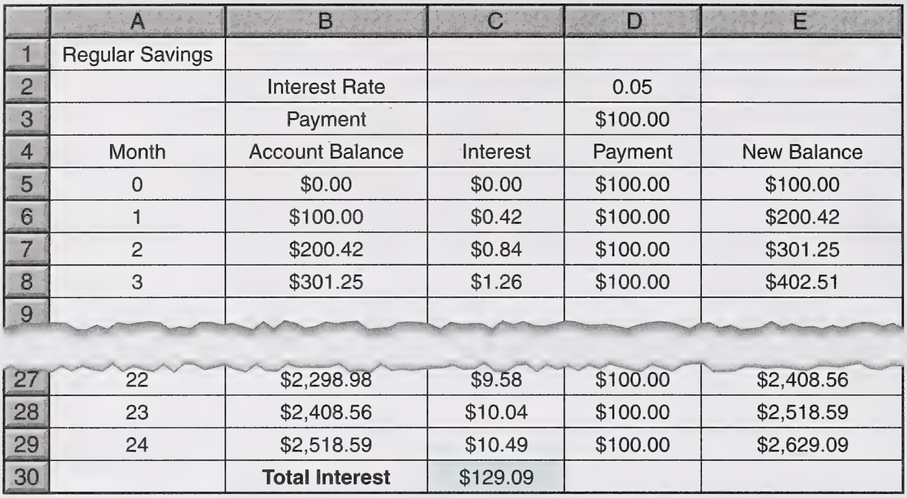
6. and 7. Your spreadsheet should look like the following.



	A	B	C	D	E
1	Regular Savings				
2		Interest Rate		0.05	
3		Payment		$100.00	
4	Month	Account Balance	Interest	Payment	New Balance
5	0	$0.00	$0.00	$100.00	$100.00
6	1	$100.00	$0.42	$100.00	$200.42
7	2	$200.42	$0.84	$100.00	$301.25
8	3	$301.25	$1.26	$100.00	$402.51
9	4	$402.51	$1.68	$100.00	$504.18
10	5	$504.18	$2.10	$100.00	$606.28
11	6	$606.28	$2.53	$100.00	$708.81
12	7	$708.81	$2.95	$100.00	$811.76
13	8	$811.76	$3.38	$100.00	$915.15
14	9	$915.15	$3.81	$100.00	$1,018.96
15	10	$1,018.96	$4.25	$100.00	$1,123.21
16	11	$1,123.21	$4.68	$100.00	$1,227.89
17	12	$1,227.89	$5.12	$100.00	$1,333.00
18	13	$1,333.00	$5.55	$100.00	$1,438.56
19	14	$1,438.56	$5.99	$100.00	$1,544.55
20	15	$1,544.55	$6.44	$100.00	$1,650.99
21	16	$1,650.99	$6.88	$100.00	$1,757.86
22	17	$1,757.86	$7.32	$100.00	$1,865.19
23	18	$1,865.19	$7.77	$100.00	$1,972.96
24	19	$1,972.96	$8.22	$100.00	$2,081.18
25	20	$2,081.18	$8.67	$100.00	$2,189.85
26	21	$2,189.85	$9.12	$100.00	$2,298.98
27	22	$2,298.98	$9.58	$100.00	$2,408.56
28	23	$2,408.56	$10.04	$100.00	$2,518.59
29	24	$2,518.59	$10.49	$100.00	$2.629.09

Activity 7 (continued)

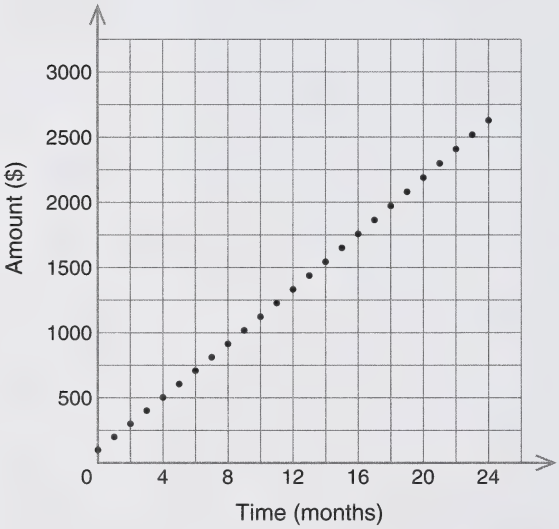
8. Use the spreadsheet to find the sum of cells C5 to C29.



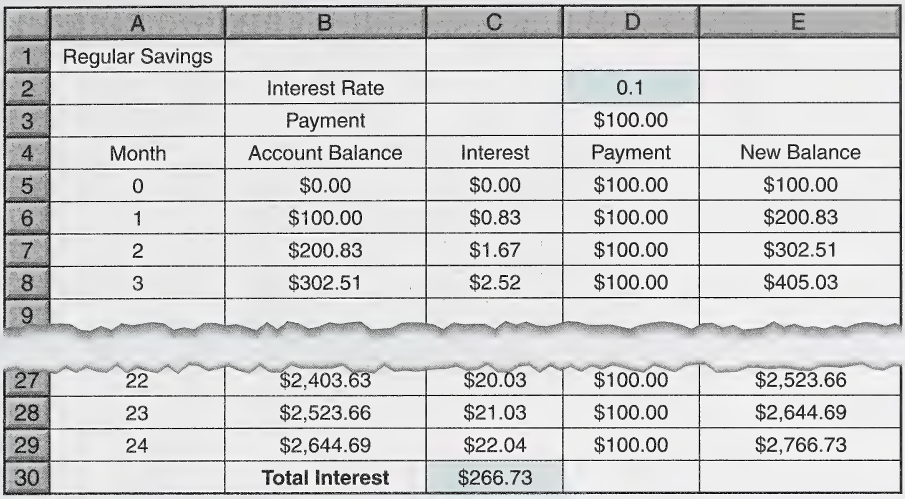
	A	B	C	D	E
1	Regular Savings				
2		Interest Rate		0.05	
3		Payment		$100.00	
4	Month	Account Balance	Interest	Payment	New Balance
5	0	$0.00	$0.00	$100.00	$100.00
6	1	$100.00	$0.42	$100.00	$200.42
7	2	$200.42	$0.84	$100.00	$301.25
8	3	$301.25	$1.26	$100.00	$402.51
9					
27	22	$2,298.98	$9.58	$100.00	$2,408.56
28	23	$2,408.56	$10.04	$100.00	$2,518.59
29	24	$2,518.59	$10.49	$100.00	$2,629.09
30		**Total Interest**	$129.09		

The total interest earned over the 2 years is $129.09.

9.



10.



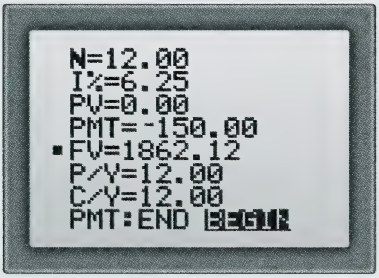
	A	B	C	D	E
1	Regular Savings				
2		Interest Rate		0.1	
3		Payment		$100.00	
4	Month	Account Balance	Interest	Payment	New Balance
5	0	$0.00	$0.00	$100.00	$100.00
6	1	$100.00	$0.83	$100.00	$200.83
7	2	$200.83	$1.67	$100.00	$302.51
8	3	$302.51	$2.52	$100.00	$405.03
9					
27	22	$2,403.63	$20.03	$100.00	$2,523.66
28	23	$2,523.66	$21.03	$100.00	$2,644.69
29	24	$2,644.69	$22.04	$100.00	$2,766.73
30		**Total Interest**	$266.73		

The total interest earned is $266.73.

11. The interest earned at 10%, compounded monthly, is more than double the interest earned at 5%, compounded monthly. You will earn more interest at the higher percentage rate.

4. Textbook exercise 8 of "Exercises: Checking Your Skills," p. 270

8. a. Using the TVM Solver, enter the known values and solve for FV.

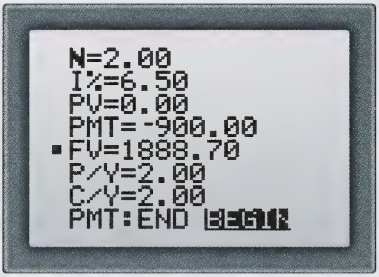


```
N=12.00
I%=6.25
PV=0.00
PMT=-150.00
▪FV=1862.12
P/Y=12.00
C/Y=12.00
PMT:END BEGIN
```

The accumulated amount after 1 year at 6.25%, compounded monthly, will be $1862.12.

Activity 7 (continued)

b. Using the TVM Solver, enter the known values and solve for FV.



```
N=2.00
I%=6.50
PV=0.00
PMT=-900.00
▪FV=1888.70
P/Y=2.00
C/Y=2.00
PMT:END BEGIN
```

The accumulated amount after 1 year at 6.5%, compounded semi-annually, will be $1888.70.

Option b. is better because Yvonne will earn more interest.

5. **Textbook exercise "Communicating the Ideas," p. 270**

Answers will vary. A sample answer is given.

Two of the keys to accumulating wealth is investing early and taking advantage of the power of compound interest. Consider the following example:

> If you started investing in an RRSP at age 18 and contributed $100 a month into an account earning 6%, compounded semi-annually, you will have $307 167.70 by the age of 65. Your total contributions will be $56 400, and the interest earned will be $250 767.70.
>
> If you delayed investing until age 40 and contributed $188 a month into an account earning 6%, compounded semi-annually, you will only have $129 452.34 by the age of 65.
>
> In both cases, your total contribution is the same; but in the second case, you will have earned only $73 052.34 in interest. This is less than $\frac{1}{3}$ of the first option.

Activity 8: Preparing a Budget

1. A budget is a written plan outlining how money will be spent. A balanced budget is a budget in which income and expenses are equal.

2. a. **Textbook exercises 1 and 2 of "Discussing the Ideas," p. 274**

   1. A long-term goal is a goal you plan to meet well into the future. Retirement for a young person just starting out in the work force is an example of a long-term goal.

      A short-term goal is a goal you plan to meet in the immediate future. Putting aside $100 this month for your savings account is an example of a short-term goal.

2. Besides gifts, the miscellaneous category may include the purchase of newspapers, magazine subscriptions, lottery tickets, and donations to charities.

b. Textbook exercises 1, 2, 3, and 5 of "Exercises: Checking Your Skills," pp. 275 and 276

1. a. $\text{Total amount} = \$400 + \$325 + \$50 + \$450 + \$140 + \$25 + \$150$

$= \$1540$

Express each amount as a percent of the sum.

$$\text{e.g., Housing and utilities} = \frac{400}{1540} \times 100\% = 26.0\%$$

The percentages appear in the following table along with the recommended values from page 271 of the textbook.

Expense Category	Actual (%)	Recommended (%)
Housing and utilities	26.0	27 to 33
Food and clothing	21.1	20 to 26
Health and personal care	3.2	3 to 5
Transportation	29.2	12 to 14
Recreation and education	9.1	6 to 8
Savings	1.6	6 to 10
Miscellaneous	9.7	12 to 18

b. The person is overspending in transportation and in recreation and education. The person is underspending in housing and utilities, in savings, and in miscellaneous expenses. Spending is within the guidelines in food and clothing and in health and personal care.

2. a. Housing and utilities should be between 27% and 33% of Eric's income.

$0.27 \times \$32\,000 = \$8640$ or \$720.00 per month

$0.33 \times \$32\,000 = \$10\,560$ or \$880.00 per month

Eric should budget between \$720.00 and \$880.00 per month for housing and utilities.

b. Food and clothing should be between 20% and 26% of Eric's income.

$0.20 \times \$32\ 000 = \$6400$ or \$533.33 per month

$0.26 \times \$32\ 000 = \$8320$ or \$693.33 per month

Eric should budget between \$533.33 and \$693.33 per month for food and clothing.

c. Transportation should be between 12% and 14% of Eric's income.

$0.12 \times \$32\ 000 = \$3840$ or \$320.00 per month

$0.14 \times \$32\ 000 = \$4480$ or \$373.33 per month

Eric should budget between \$320.00 and \$373.33 per month for transportation.

d. Savings should be between 6% and 10% of Eric's income.

$0.06 \times \$32\ 000 = \$1920$ or \$160.00 per month

$0.10 \times \$32\ 000 = \$3200$ or \$266.67 per month

Eric should budget between \$160.00 and \$266.67 per month for savings.

3. Answers will vary. A sample answer is given.

Currently, Jodi spends 26% on transportation. According to the recommended guidelines in the textbook, she should only spend between 12% and 14% on transportation. If she can reduce her transportation expenses to 14%, she will save $26\% - 14\% = 12\%$ of her income.

$0.12 \times \$1500 = \$180$

She is also spending about 5% more than she should on housing and utilities.

$0.05 \times \$1500 = \$75$

By reducing her spending in these two categories to the maximum recommended guidelines, she could save $\$180 + \$75 = \$255$, thus saving enough to cover her school costs.

One suggestion is that Jodi get a new, less-expensive apartment closer to work and school; then she could use public transportation as much as possible to reduce her tansportation costs to within the recommended guidelines.

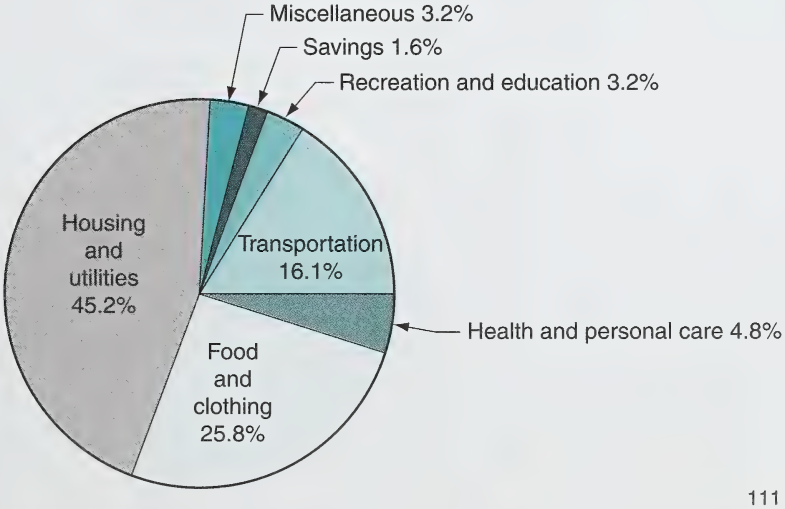
5. **a.** Add the amounts. The Zunigas's income is \$3100. They currently budget \$700 for transportation. This amount is $\frac{700}{3100} \times 100\% = 22.6\%$ of their income, considerably beyond the recommended 12% to 14%. If they can reduce their transportation budget by \$200 (or by $\frac{200}{3100} \times 100\% = 6.5\%$), they will have sufficient funds for their increased mortgage payments. The revised budget looks like the following.

Zuniga Family's Monthly Budget

Expense Category	Amount ($)	Percent (%)
Housing and utilities	1400	45.2
Food and clothing	800	25.8
Health and personal care	150	4.8
Transportation	500	16.1
Recreation and education	100	3.2
Savings	50	1.6
Miscellaneous	100	3.2

b. Draw a circle graph of the Zuniga family's monthly budget. To determine the central angle (in degrees) for each category, multiply the percent by 360°.

$$\begin{aligned}\text{e.g., Housing and utilities } &= 45.2\% \text{ of } 360^\circ \\ &= 0.452 \times 360^\circ \\ &\doteq 162.7^\circ\end{aligned}$$



Activity 8 (continued)

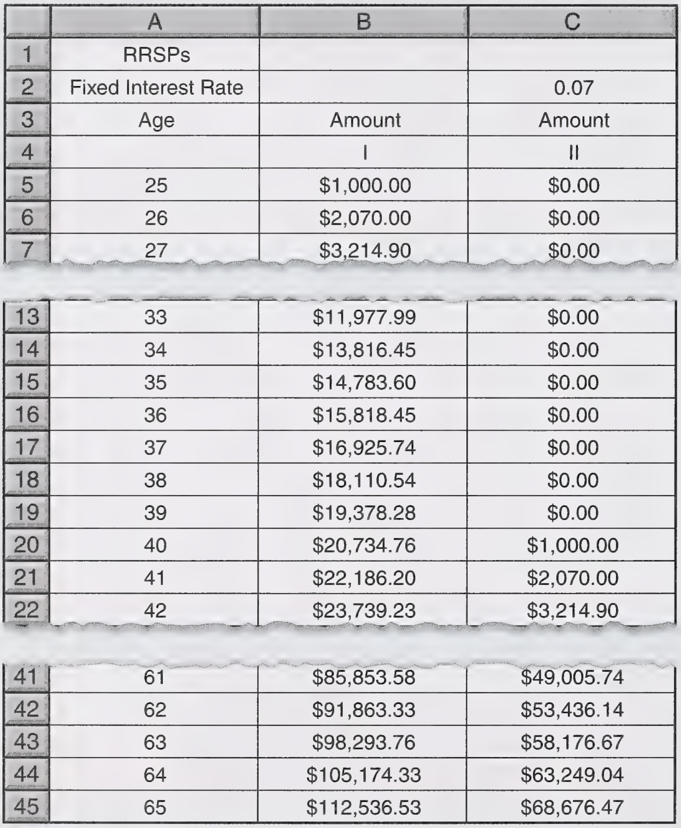
3. **Textbook exercise "Communicating the Ideas," p. 277**

A budget is a written plan outlining how money is to be spent. It is important to create a budget to avoid financial difficulties and to save money for future goals. Your goals will determine your financial priorities and how to portion expenses. For example, if you plan to pursue your education, you should save towards this objective so you can meet school needs and unexpected emergencies.

Follow-up Activities

1. **Textbook exercise 1 of Part A of "What Should I Be Able to Do?," p. 281**

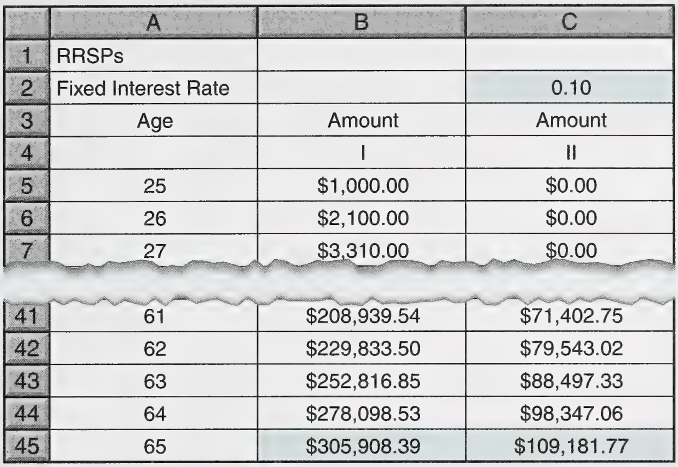
1. **a.** Your spreadsheet should look like the following.



	A	B	C
1	RRSPs		
2	Fixed Interest Rate		0.07
3	Age	Amount	Amount
4		I	II
5	25	$1,000.00	$0.00
6	26	$2,070.00	$0.00
7	27	$3,214.90	$0.00
13	33	$11,977.99	$0.00
14	34	$13,816.45	$0.00
15	35	$14,783.60	$0.00
16	36	$15,818.45	$0.00
17	37	$16,925.74	$0.00
18	38	$18,110.54	$0.00
19	39	$19,378.28	$0.00
20	40	$20,734.76	$1,000.00
21	41	$22,186.20	$2,070.00
22	42	$23,739.23	$3,214.90
41	61	$85,853.58	$49,005.74
42	62	$91,863.33	$53,436.14
43	63	$98,293.76	$58,176.67
44	64	$105,174.33	$63,249.04
45	65	$112,536.53	$68,676.47

b. The final amount for Plan I is $112 536.53, and the final amount for Plan II is $68 676.47. A total of $10 000.00 was contributed to Plan I and $26 000.00 was contributed to Plan II. Even though Plan II contributed $16 000 more to the RRSP than Plan I, its final balance ended up being $43 860.06 less than Plan I. Plan I is definitely the better plan.

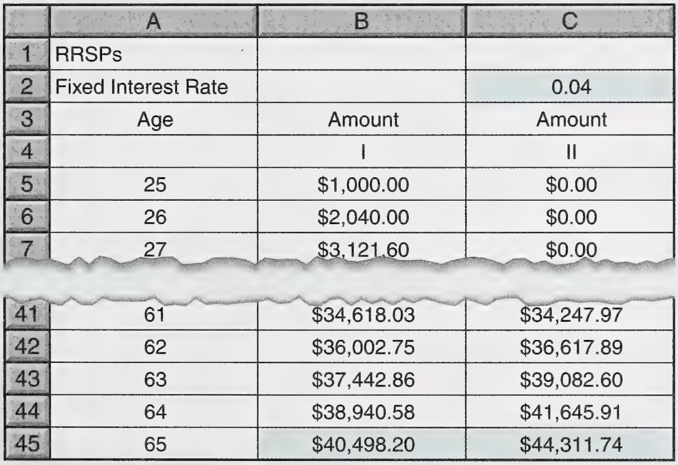
c. First compare the two plans for an interest rate of 10%. Enter 0.1 in cell C2.



	A	B	C
1	RRSPs		
2	Fixed Interest Rate		0.10
3	Age	Amount	Amount
4		I	II
5	25	$1,000.00	$0.00
6	26	$2,100.00	$0.00
7	27	$3,310.00	$0.00
41	61	$208,939.54	$71,402.75
42	62	$229,833.50	$79,543.02
43	63	$252,816.85	$88,497.33
44	64	$278,098.53	$98,347.06
45	65	$305,908.39	$109,181.77

The advantage of Plan I is even more apparent for higher interest rates. At 10%, the final balance of Plan I is $196 726.62 more than the final balance for Plan II.

Now, try a smaller interest rate, like 4%.



	A	B	C
1	RRSPs		
2	Fixed Interest Rate		0.04
3	Age	Amount	Amount
4		I	II
5	25	$1,000.00	$0.00
6	26	$2,040.00	$0.00
7	27	$3,121.60	$0.00
41	61	$34,618.03	$34,247.97
42	62	$36,002.75	$36,617.89
43	63	$37,442.86	$39,082.60
44	64	$38,940.58	$41,645.91
45	65	$40,498.20	$44,311.74

At 4%, the final balance of Plan II is $3813.54 more than the final balance of Plan I. Plan II, though, required $16 000 more in contributions than Plan I. So, in this case, Plan I is still the better plan.

Follow-up Activities (continued)

2. **Textbook exercises 3, 4, 6, 7.a., 8, 9, 10, and 11 of Part B of "What Should I Be Able to Do?," pp. 282 and 283**

3. Jeremy's gross pay $= 40 \times \$12.50 + 10 \times 2 \times \$12.50$

$$\begin{aligned} &= \$500.00 + \$250.00 \\ &= \$750.00 \end{aligned}$$

$$\begin{aligned} \text{Taxable income} &= \text{Gross income} - \text{Union dues} \\ &= \$750.00 - \$15.00 \\ &= \$735.00 \end{aligned}$$

His annual taxable income is $52 \times \$735.00$, or \$38 220.

Income tax for an annual taxable income from \$30 000 to \$60 000 is approximately 29%.

$$\begin{aligned} \therefore \text{ Income tax} &= 0.29 \times \$38\,220 \\ &= \$11\,083.80 \end{aligned}$$

Jeremy's weekly tax is $\frac{\$11\,083.80}{52} = \$213.15$.

His Employment Insurance premiums are 3% of his gross income.

$$\begin{aligned} \therefore \text{ EI} &= 0.03 \times \$750.00 \\ &= \$22.50 \end{aligned}$$

Jeremy's Canada Pension Plan contributions are also 3% of his gross earnings, or \$22.50 per week.

$$\begin{aligned} \therefore \text{ Net income} &= \text{Gross income} - (\text{Income tax} + \text{EI} + \text{CPP} + \text{Union dues} + \text{Parking}) \\ &= \$750.00 - (\$213.15 + \$22.50 + \$22.50 + 15.00 + 10.00) \\ &= \$750.00 - 283.15 \\ &= \$466.85 \end{aligned}$$

Jeremy's weekly net pay is approximately \$466.85.

4. Assessed value $= 0.90 \times \$195\,000$

$= \$175\,500$

$$\therefore \text{ Property tax} = \frac{\text{Assessed value} \times \text{Mill rate}}{1000}$$

$$= \frac{\$175\,500 \times 31.2}{1000}$$

$$= \$5475.60$$

Therefore, the Smith's monthly tax payment is $\frac{\$5475.60}{12} = \$456.30$.

6. US $0.6615 = Can $1.00

$$\frac{\text{US }\$0.6615}{0.6615} = \frac{\text{Can }\$1.00}{0.6615}$$

US $1.00 = Can $1.5117

7. **a.** Use the compound interest formula, $A = P(1+i)^n$.

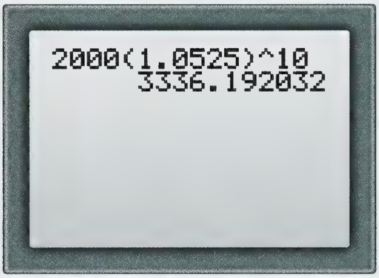
$P = \$2000$, $i = 0.0525$, and $n = 10$

$$\therefore A = P(1+i)^n$$

$$= 2000(1+0.0525)^{10}$$

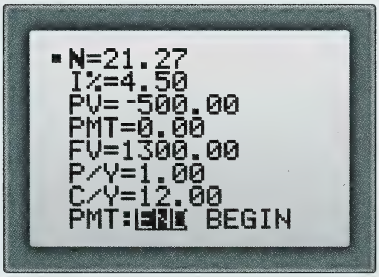
$$= 2000(1.0525)^{10}$$

$$= \$3336.19$$



```
2000(1.0525)^10
     3336.192032
```

8. Using the TVM Solver, enter the known values and solve for N.

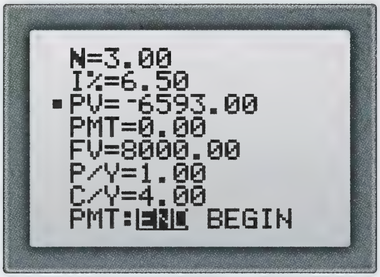


```
▪N=21.27
 I%=4.50
 PV=-500.00
 PMT=0.00
 FV=1300.00
 P/Y=1.00
 C/Y=12.00
 PMT:END BEGIN
```

Because 0.27 years is $0.27 \times 12 = 3.24$ months, and because interest is calculated monthly, the time for $500 to accumulate to $1300 is 21 years, 4 months.

Follow-up Activities (continued)

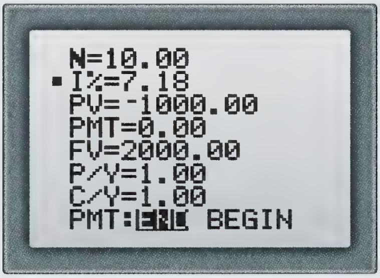
9. Using the TVM Solver, enter the known values and solve for the present value, PV.



```
 N=3.00
 I%=6.50
▪PV=-6593.00
 PMT=0.00
 FV=8000.00
 P/Y=1.00
 C/Y=4.00
 PMT:END BEGIN
```

You must invest $6593.00 today for the investment to accumulate to $8000.00 in 3 years.

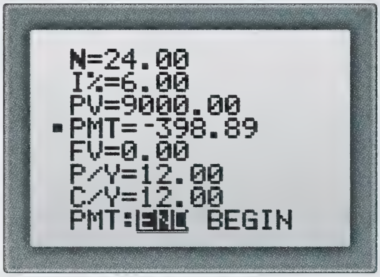
10. Using the TVM Solver, enter the known values and solve for the interest rate, I%.



```
 N=10.00
▪I%=7.18
 PV=-1000.00
 PMT=0.00
 FV=2000.00
 P/Y=1.00
 C/Y=1.00
 PMT:END BEGIN
```

The interest rate required to double an investment of $1000 in 10 years is 7.18%, compounded annually.

11. **a.** Using the TVM solver, enter the known values and solve for the payment, PMT.



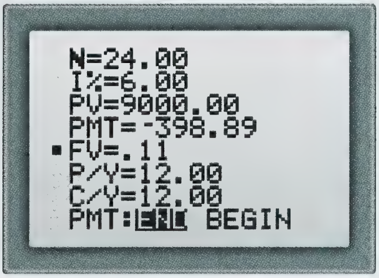
```
 N=24.00
 I%=6.00
 PV=9000.00
▪PMT=-398.89
 FV=0.00
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

There are 24 monthly payments in 2 years.

The monthly loan payment is $398.89.

b. Because the monthly payment determined in exercise 11.a. is a rounded value, the final monthly payment will need to be adjusted to zero out the account.

To determine the adjustment, use the TVM Solver and re-enter the payment as "–398.89."
Remember: If you don't re-enter the payment, the calculator will use the unrounded number for the payment, thus showing no adjustment.



```
 N=24.00
 I%=6.00
 PV=9000.00
 PMT=-398.89
▪FV=.11
 P/Y=12.00
 C/Y=12.00
 PMT:END BEGIN
```

Because the future value shows an overpayment of \$0.11 (or 11¢), the final payment will be \$398.78.

$$\begin{aligned}\therefore \text{ Total cost of loan} &= 23\times\$398.89+\$398.78\\ &= \$9174.47+\$398.78\\ &= \$9573.25\end{aligned}$$

$$\begin{aligned}\therefore \text{ Finance charge} &= \text{Total cost of loan} - \text{Loan}\\ &= \$9573.25-\$9000.00\\ &= \$573.25\end{aligned}$$

The finance charge for the loan is \$573.25.

Follow-up Activities (continued)

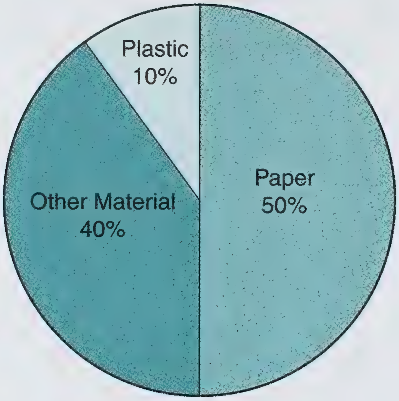
Extra Help

1. Textbook exercise 1 of "Practise Your Prior Skills," p. 274

1. $\text{Paper} = 0.50 \times 360° = 180°$ $\text{Plastic} = 0.10 \times 360° = 36°$ $\text{Other material} = 0.40 \times 360° = 144°$

Use these angles to construct a circle graph.

Contents of a Garbage Load



2. Circle graphs are used in budget discussions because it is easier to visualize how the budget is divided proportionally among the categories.

Enrichment

1. Because PV is negative, this is money deposited. Because PMT is negative, these are deposits rather than payments received. The following is one possible scenario:

   Initially, $5000 is deposited into an account bearing interest at 9%, compounded monthly. Subsequently, $1000 is deposited at the end of each month for 36 months, or 3 years. At the end of 3 years, the accumulated value in the account is $47 695.94.

2. Because PV is negative, this is money deposited. The following is one possible scenario:

   A deposit of $5000 is placed into an account bearing 9% annual interest, compounded semi-annually. At the end of 20 years, the amount in this account is $29 081.82.

Module Project: Budgeting for Living Independently

Completing the Project

1. Textbook exercises 1 to 8 of "The Cost of Running a Car," pp. 242 and 243

1. Cost of the car = List price + GST + PST

$$\begin{aligned} &= \$18\,253.00 + (0.07 \times \$18\,253) + \text{PST} \\ &= \$18\,253.00 + \$1277.71 + \text{PST} \\ &= \$19\,530.71 + \text{PST} \end{aligned}$$

The total cost of the car is $19 530.71 plus the provincial sales tax in your province. In Saskatchewan, for example, PST is 6%.

$$\begin{aligned} \therefore \text{ Cost of the car} &= \$19\,530.71 + 0.06 \times \$18\,253.00 \\ &= \$19\,530.71 + \$1095.18 \\ &= \$20\,625.89 \end{aligned}$$

2. Total cost = Down payment + Total monthly payments

$$\begin{aligned} &= \$8800.00 + 36 \times \$365.81 \\ &= \$8800.00 + \$13\,169.16 \\ &= \$21\,969.16 \end{aligned}$$

3. Total lease payment = Down payment + Total monthly payments

$$\begin{aligned} &= \$8800.00 + 36 \times \$106.65 \\ &= \$8800.00 + \$3839.40 \\ &= \$12\,639.40 \end{aligned}$$

$$\begin{aligned} \text{Option to purchase} &= \$8531.00 + \text{GST} + \text{PST} \\ &= \$8531.00 + (0.07 \times \$8531.00) + \text{PST} \\ &= \$8531.00 + \$597.17 + \text{PST} \\ &= \$9128.17 + \text{PST} \end{aligned}$$

In Saskatchewan, PST is 6%.

$$\begin{aligned} \therefore \text{ Option to purchase} &= \$9128.17 + 0.06 \times \$8531.00 \\ &= \$9128.17 + \$511.86 \\ &= \$9640.03 \end{aligned}$$

$$\begin{aligned} \therefore \text{ Total cost} &= \text{Total lease payments} + \text{Option to purchase} \\ &= \$12\,639.40 + \$9640.03 \\ &= \$22\,279.43 \end{aligned}$$

Module Project (continued)

4. Answers will vary depending on the province and the year. For example, the cost of registering a passenger vehicle for 1 year in Alberta in 2001 is $53.25.

5. Answers will vary.

6. Answers will vary. If you purchase a new vehicle, what does the manufacturer's warranty cover? What does it not cover? Oil changes are not covered under warranty and are usually done every 5000 km for a cost of approximately $30. If you drive the car 20 000 km per year, you will need 4 oil changes in a year at a cost of about $120.

7. Answers will vary depending on the type of car. A car with a fuel rating of 10 km/L will use $20\ 000\ \text{km} \div 10\ \text{km/L} = 2000\ \text{L}$ of fuel per year. The cost will be $2000\ \text{L} \times \$0.65/\text{L} = \$1300$ per year.

8. Answers will vary. According to the figures in exercises 2 and 3, it would be better to buy the car rather than lease the car. To determine the total cost over 3 years, add the cost of the car to the registration fees, insurance, oil changes, and fuel costs for 3 years.

2. Textbook exercises of Part C of "What Should I Be Able to Do?," pp. 284 and 285

There is sufficient information to create a budget for Cody. In the Determination of Income section, there are problems with the deductions for CPP and EI. The amount used ($1650) for CPP is too large because the maximum payment required is $1186.50. Likewise, the amount used for EI ($1650) is too large because the maximum payment required is $994.50. (See page 231 of the textbook.)

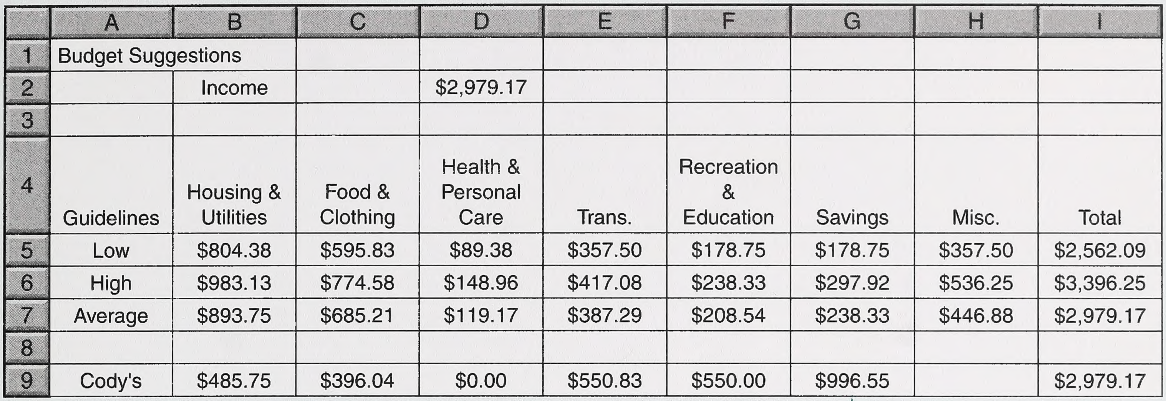
$$\begin{aligned}\therefore \text{ Personal annual income} &= \$55\ 000.00 - (\$994.50 + \$1186.50 + \$15\ 950.00) \\ &= \$55\ 000.00 - \$18\ 131.00 \\ &= \$36\ 869.00\end{aligned}$$

In the sample budget, because the annual net income is actually $36 869.00, the average monthly income is $3072.42. Also, the total of the Monthly Expenses is incorrect. It should be $1982.62, not $1907.62.

Therefore, the Summary section of the Monthly Budget form should be as follows:

SUMMARY

Average Monthly Income			1)	**$3,072.42**
Savings	2)	$595.83		
Total Monthly Expenses	3)	**$1,982.62**		
Total Amount $2+3$				**$2,578.45**
Amount Available for Other Savings			5)	**$493.97**



	A	B	C	D	E	F	G	H	I
1	Budget Suggestions								
2		Income		$2,979.17					
3									
4	Guidelines	Housing & Utilities	Food & Clothing	Health & Personal Care	Trans.	Recreation & Education	Savings	Misc.	Total
5	Low	$804.38	$595.83	$89.38	$357.50	$178.75	$178.75	$357.50	$2,562.09
6	High	$983.13	$774.58	$148.96	$417.08	$238.33	$297.92	$536.25	$3,396.25
7	Average	$893.75	$685.21	$119.17	$387.29	$208.54	$238.33	$446.88	$2,979.17
8									
9	Cody's	$485.75	$396.04	$0.00	$550.83	$550.00	$996.55		$2,979.17

$595.83 + $400.72

It seems that the budgeted amounts are considerably different in each category from those suggested on page 271 of the textbook.

Although housing appears low, the fact that Cody is single must be taken into consideration. The amount budgeted for food and clothing may be too low. There is no interest on the loan used to buy the car. The amount budgeted for recreation (entertainment) may be high considering the description of Cody's lifestyle given on page 284 of the textbook.

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